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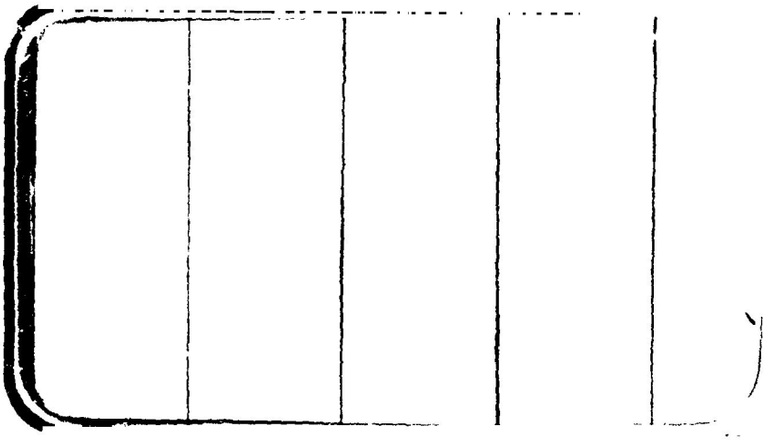

SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA MANagement services

SPACE DIVISION CHRYSLER CORPORATION

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RESULTS OF AEROTHERMODYNAMIC HEATING TESTS ON A 0.013-SCALE MODEL SOLID ROCKET BOOSTER IN THE NASA/LaRC UNITARY PLAN WIND TUNNEL (SH12F)

by

Edwin B. Brewer
Thermal Environment Branch
Marshall Space Flight Center

Prepared under NASA Contract Number NAS9-13247

by

Data Management Services
Chrysler Corporation Space Division
New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number:	NASA/LaRC UPWT 1115
NASA Series Number:	SH12F
Test Dates:	July 29 - August 7, 1974
Occupancy Hours:	80

FACILITY ENGINEER:

Bernard Spencer, Jr.
Applied Aerodynamic Section
Langley Research Center
Mail Stop 411
Hampton, Virginia 23665

Phone: (804) 827-3911

PROJECT ENGINEER:

Edwin B. Brewer
Thermal Environment Branch
Marshall Space Flight Center
Mail Stop ED34
Huntsville, Alabama 35812

Phone: (205) 453-1157

DATA MANAGEMENT SERVICES:

Prepared by: Liaison--J. E. Vaughn
Operations--J. T. Daviet

Reveiwed by: D. E. Poucher, J. L. Glynn JLG.

Approved: _____ Concurrence: _____
N. D. Kemp, Manager
Data Management Services

J. G. Swider, Manager
Flight Technology Branch

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RESULTS OF AEROTHERMODYNAMIC HEATING TESTS ON A 0.013 SCALE MODEL SOLID ROCKET BOOSTER IN THE NASA/LaRC UNITARY PLAN WIND TUNNEL (SH12F)

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Edwin B. Brewer, NASA/MSFC

ABSTRACT

A 0.013 scale model of the Solid Rocket Booster (SRB) used to launch the Space Shuttle has been tested in the NASA/LaRC Unitary Plan Wind Tunnel at a Mach number of 3.7 and Reynolds numbers of 1.5 and 3.5 x 10^6 per foot. The objective of the test was to obtain aerodynamic heat transfer data on the surface of scaled models of the SRB at simulated full scale reentry flight conditions. Three separate models were utilized to measure film coefficients over an angle of attack range from 0° to 180° at 0° sideslip. All three models were representations of the MCR0200 baseline configuration and varied only by the way they were mounted in the tunnel. Model A (denoted 1.0 on the plots), sting mounted thru the model base, was utilized for testing between 0° and 40° angle of attack. Model B (2.0) was blade mounted from the top of the model and was tested between 60° and 120° angle of attack. Model C (3.0) was sting mounted thru the model nose and utilized for testing between 140° and 180° angle of attack.

TABLE OF CONTENTS

INDEX OF MODEL FIGURES

INDEX OF DATA FIGURES

FIGURE NUMBER	TITLE	SCHEDULE OF COEFFICIENTS PLOTTED	CONDITIONS VARYING	PAGES
4	H/HREF ALONG TOP AND BOTTOM CENTERLINE (WITH BOUNDRY LAYER TRIP)	A	THETA, ALPHA	1-3
5	H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L = 1.5)	A	THETA, ALPHA MODEL	4-17
6	H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L = 3.5)	A	THETA, ALPHA MODEL	18-32
7	H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP AND RING)	A	THETA, ALPHA	33-36
8	H/HREF RADIALLY AT VARIOUS X/L STATIONS (WITH BOUNDRY LAYER TRIP)	B	X/L, ALPHA	37-42
9	H/HREF RADIALLY AT VARIOUS X/L STATIONS (W/O BNDRY LAYER TRIP, RN/L = 1.5,	B	X/L, ALPHA MODEL	43-79
10	H/HREF RADIALLY AT VARIOUS X/L STATIONS (W/O BNDRY LAYER TRIP, RN/L = 3.5)	B	X/L, ALPHA MODEL	80-119
11	H/HREF RADIALLY AT VARIOUS X/L STATIONS (W/O BNDRY LAYER TRIP AND RING)	B	X/L, ALPHA	120-127

SCHEDULE OF COEFFICIENTS PLOTTED:

(A) H/HREF versus X/L

(B) H/HREF versus THETA

NOMENCLATURE

SYMBOL	PLOT SYMBOL	DEFINITION
α	ALPHA	angle of attack, degrees
β	BETA	angle of sideslip, degrees
b		skin thickness, ft.
c		specific heat of skin material, BTU/LB °R
C_p		specific heat of air at constant pressure
h	H	heat transfer coefficient, BTU/FT^2
h_o		heat transfer coefficient based on free-stream conditions
h_{ref}	HREF	stagnation point heat transfer coefficient for reference sphere
h/h_{ref}	H/HREF	ratio of model heat transfer coefficient to heat transfer coefficient of reference sphere
H_o	PO	free-stream tunnel stagnation pressure, psf
k		heat conductivity of skin, BTU/FT-SEC-°R
M_∞	MACH	free-stream Mach number
Model	MODEL	model number as follows 1 - Model A, aft sting mount 2 - Model B, center sting mount 3 - Model C, forward sting mount
N_{St_o}		Stanton number based on free-stream conditions
$P_{t,1}$		free-stream stagnation pressure, psf
$P_{t,2}$		stagnation pressure behind normal shock
$\dot{q}$		heat transfer rate
R		gas constant

NOMENCLATURE (Concluded)

SYMBOL	PLOT SYMBOL	DEFINITION
R_N	RN/L	free-stream Reynolds number per foot
t		time, sec.
T_o	TO	stagnation temperature, °R
T_e		equilibrium temperature, °R
$T_{e,1}$		equilibrium temperature measured prior to heat bump, °R
T_w		model wall temperature, °R
$T_{w,o}$		initial wall temperature, °R
$T_{w,t}$		wall temperature at time t, °R
θ	THETA	radial position measured counterclockwise looking forward, 0 degrees at top centerline
V_∞		free-stream velocity, ft/sec
w		W x b, lb/ft^2
W		skin weight, lb/ft^3
X/L	X/L	longitudinal location, fraction of body length
ρ_∞		free-stream density
ρ_w		density along model wall
$\rho_{t,2}$		stagnation density behind normal shock
μ_o		viscosity based on stagnation temperature
μ_w		viscosity along model wall
$\mu_{t,2}$		stagnation viscosity behind normal shock

CONFIGURATIONS INVESTIGATED

These tests utilized three separate 0.013 scale model representation of the MCR0200 baseline configuration to cover the test angle of attack range of 0° to 180°. The three models differed only in their tunnel support modification.

Model A, sting mounted thru the model base, was designed to be tested from α = 0° to 40°. Figure 2(a) shows the model and the thermocouple locations. During the test, five thermocouples on this model were inoperative: 1, 2, 17, 47, and 79. These have been circled in the Figure and in Table I, which supplements Figure 2(a) concerning thermocouple locations.

A Model A installation photograph appears in Figure 3(a). Model A was tested with and without the aft attach ring. The ring may be seen in the figure. Model A was also tested with and without a boundary layer trip of number 35 grit located on the nose of the SRB.

Testing the angle-of-attack range of 0° to 40° for Model A was accomplished by rotating the sting from α = 0° to 15° during testing, shutting down the tunnel, changing the sting adapter to set a 30° bias on the sting position, and then testing from α = 30° to 40°. A similar procedure was used on Models B and C.

Model B, blade mounted from the model top center, was designed to be tested from α = 60° to 120°. Inoperative thermocouples are circled on Figure 2(b) and in Table II (4, 52, 59, and 79). Numbers 71 and 72, although wired in reverse, were operative. Model B installation photographs appear in Figures 3(b) and 3(c). Figure 3(c) shows Model B with three

protuberances installed. During the first tunnel warmup run, the two forward protuberances blew off the model due to adhesive failure.

The aft protuberance simulates the stage separation motors. This protuberance was on Model B for runs 34 through 41.

Model C, sting mounted thru the model nose, was designed to be tested from α = 140° to 180°. Two pairs of reversed thermocouples were discovered; 17 with 18 and 109 with 98. These are marked on Figure 2(c) and in Table III. Model C is shown installed in the test section in Figure 3(d).

Table IV summarizes the tests by collating the configuration tested with the specific tunnel run number. It also gives the other salient test parameters.

The models are of thin skin design. Taole V lists the physical constants for the model material which was 17-4 PH H900 stainless steel.

TEST FACILITY DESCRIPTION

The Langley Research Center Unitary Plan Wind Tunnel is an air-medium continuous-flow facility consisting of two test sections. Asymmetrical sliding-block type throats control Mach number, and models can be supported from stings mounted to the side-wall strut-systems. Each test section is 4 feet by 4 feet. Section Number 1 operates at M = 1.47 to M = 2.86 and Section Number 2 operates at M = 2.29 to M = 4.63.

Reynolds numbers and tunnel pressures are variable, with limitations prescribed by tunnel capabilities and model load designs. Normal operating total temperature is 150°F.

DATA REDUCTION

The basic heat balance equation is

$$q_{aero} = q_{stored} + q_{losses}$$

when neglecting losses, the equation can be written

$$h(T_e - T_w) = Wbc \frac{dT_w}{dt}$$

and by rearranging

$$\frac{T_e}{T_o}\int_o^t T_o\, dt - \int_o^t T_w\, dt = \frac{wc}{h}\int_{T_{w,o}}^{T_{w,t}} d\, T_w$$

where T_e/T_o is experimentally determined. Thus

$$h = \frac{wc\ (T_{w,t} - T_{w,o})}{\frac{T_e}{T_o}\sum_o^t T_o\, \Delta t - \sum_o^t T_w\, \Delta t}$$

or when considering the losses due to conduction

$$h = \frac{wc\ (T_{w,t} - T_{w,o}) - kb \sum_o^t \nabla^2 T_w}{\frac{T_e}{T_o}\sum_o^t T_o\, \Delta t - \sum_o^t T_w\, \Delta t}$$

where

$$\nabla^2 T_w = \frac{\delta^2 T_w}{\delta X^2} + \frac{\delta^2 T_w}{\delta Y^2}$$

and

$$\frac{\delta^2 T_w}{\delta X^2} = \left\{ \frac{T_{n+1} - \left(T_{e,1}\right)_{n+1} - \left[T_n - \left(T_{e,1}\right)_n\right]}{X_{n+1} - X_n} - \frac{T_n - \left(T_{e,1}\right)_n - \left[T_{n-1} - \left(T_{e,1}\right)_{n-1}\right]}{X_n - X_{n-1}} \right\} \frac{2}{X_{n+1} - X_{n-1}}$$

and

$$\frac{\delta^2 T_w}{\delta Y^2} = \left\{ \frac{T_{n+1} - \left(T_{e,1}\right)_{n+1} - \left[T_n - \left(T_{e,1}\right)_n\right]}{Y_{n+1} - Y_n} - \frac{T_n - \left(T_{e,1}\right)_n - \left[T_{n-1} - \left(T_{e,1}\right)_{n-1}\right]}{Y_n - Y_{n-1}} \right\} \frac{2}{Y_{n+1} - Y_{n-1}}$$

Symbols

W = skin weight (lb/ft^3)

w = W x b (lb/ft^2)

b = skin thickness (ft)

c = specific heat of skin material, BTU/lb°R

k = heat conductivity of skin BTU/ft-sec-°R

h = heat transfer coefficient BTU/ft^2

q = aerodynamic heat input

$T_{e,1}$ = equilibrium temperature measured prior to heat bump, °R

T_o = stagnation temperature, °R

T_w = model wall temperature, °R

X,Y = thermocouple coordinates

Subscripts

0 = time zero unless defined otherwise

t = time greater than zero

n = pertaining to thermocouple location

DATA REDUCTION (Continued)

EQUATION FOR COMPUTING REFERENCE STAGNATION POINT HEATING RATE

The stagnation point heating rate on a sphere can be determined from the following equation from Reference 1.

$$\dot{q}_o = 0.94(\rho_w \mu_w)^{0.5}\left[\frac{\rho_{t,2}\ \mu_{t,2}}{\rho_w\ \mu_w}\right]^{0.4}\ (H_o - H_w)\left\{\left(\frac{1}{r}\right)^{0.5}\ \left[2RT_o\left(1 - \frac{P_\infty}{P_{t,2}}\right)\right]^{0.25}\right\} \tag{2-1}$$

For the range of stagnation temperature and wall temperature of the present tests

$$H_o - H_w \approx C_p\ (T_o - T_w) \tag{2-2}$$

and by definition

$$N_{St_o} = \frac{q_o}{\rho_\infty\ V_\infty\ C_p\ (T_o - T_w)} \tag{2-3}$$

Substituting Eqs. 2-2 and 2-3 into Eq. 2-1 and rearranging results in

$$N_{St_o} = \frac{1.118}{\rho_\infty\ V_\infty}\ \frac{(\mu_o)^{0.5}}{(RT_o)^{0.25}}\left(\frac{1}{r}\right)^{0.5}\left(\frac{P_{t,2}}{P_{t,1}}\right)^{0.5}\ (P_{t,1})^{0.5} \tag{2-4}$$

Also by definition

$$N_{St_o} = \frac{h_o}{\rho_\infty\ V_\infty\ C_p} \tag{2-5}$$

therefore

$$h_o = 1.118\ C_p\ \frac{(\mu_o)^{0.5}}{(RT_o)^{0.25}}\left(\frac{1}{r}\right)^{0.5}\ \left(\frac{P_{t,2}}{P_{t,1}}\right)^{0.5}\ (P_{t,1})^{0.5} \tag{2-6}$$

DATA REDUCTION (Concluded)

where:

C_p = specific heat of air at constant pressure

h_0 = heat transfer coefficient based on free-stream conditions

N_{St_0} = Stanton number based on free-stream conditions

ρ_∞ = free-stream density

V_∞ = free-stream velocity

μ_0 = viscosity based on stagnation temperature

T_0 = stagnation temperature

R = gas constant

r = nose radius = 0.130 feet

$P_{t,2}$ = stagnation pressure behind normal shock

$P_{t,1}$ = free-stream stagnation pressure

The data presented herein are in ratio form H/HREF where HREF is the calculated stagnation heat transfer coefficient on a 0.013 ft. sphere (1 ft. sphere at .013 model scale).

DATA PRESENTATION

Schlieren photographs of all three models along with an identification of test conditions are contained in Appendix A. The Schlieren photographs were taken after the heat transfer tests were completed. Many of the photographs are of repeated test conditions at two model translated locations. This was done to view the flow obscured by the vertical bars on the wind-tunnel window. For example, compare the photograph for point 68 to photograph for point 69. Both are of the same configuration, Reynolds number, angle of attack, and stagnation pressure; only the sting has been translated upstream for point 69.

Tabulated data from the tests are presented in Appendix B.

REFERENCE

Fay, J. A. and Riddell, F. R., "Theory of Stagnation Point Heat Transfer in Dissociated Air", Journal of Aeronautical Sciences, February 1958.

Table I. THERMOCOUPLE LOCATION FOR MODEL A

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
1	1	0.600	0.0265	0
1	2	0.600	0.0265	90.0
1	3	0.600	0.0265	180.0
2	4	1.120	0.0495	0
2	5	1.120	0.0495	45.0
2	6	1.120	0.0495	90.0
2	7	1.120	0.0495	135.0
2	8	1.120	0.0495	180.0
3	9	2.200	0.0972	0
3	10	2.200	0.0972	22.5
3	11	2.200	0.0972	45.0
3	12	2.200	0.0972	67.5
3	13	2.200	0.0972	90.0
3	14	2.200	0.0972	112.5
3	15	2.200	0.0972	135.0
3	16	2.200	0.0972	157.5
3	17	2.200	0.0972	180.0
4	18	2.700	0.1193	0
4	19	2.700	0.1193	45.0
4	20	2.700	0.1193	90.0
4	21	2.700	0.1193	135.0
4	22	2.700	0.1193	180.0
5	23	2.950	0.1303	0
5	24	2.950	0.1303	180.0
6	25	4.050	0.1789	0
6	26	4.050	0.1789	180.0
7	27	4.300	0.1900	0
7	28	4.300	0.1900	22.5
7	29	4.300	0.1900	45.0
7	30	4.300	0.1900	67.5
7	31	4.300	0.1900	90.0
7	32	4.300	0.1900	112.5
7	33	4.300	0.1900	135.0
7	34	4.300	0.1900	157.5
7	35	4.300	0.1900	180.0
8	36	4.550	0.2010	0
8	37	4.550	0.2010	180.0
9	38	7.550	0.3336	0
9	39	7.550	0.3336	180.0
10	40	7.800	0.3446	0
10	41	7.800	0.3446	45.0
10	42	7.800	0.3446	90.0
10	43	7.800	0.3446	135.0
10	44	7.800	0.3446	180.0

Note: Model Drawing No. 80M51354

Table I. THERMOCOUPLE LOCATION FOR MODEL A (Continued)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
11	45	8.050	0.3557	0
11	46	8.050	0.3557	180.0
12	47	9.520	0.4206	0
12	48	9.520	0.4206	180.0
13	49	9.770	0.4317	0
13	50	9.770	0.4317	22.5
13	51	9.770	0.4317	45.0
13	52	9.770	0.4317	67.5
13	53	9.770	0.4317	90.0
13	54	9.770	0.4317	112.5
13	55	9.770	0.4317	135.0
13	56	9.770	0.4317	157.5
13	57	9.770	0.4317	180.0
14	58	10.020	0.4427	0
14	59	10.020	0.4427	180.0
15	60	12.000	0.5302	0
15	61	12.000	0.5302	180.0
16	62	12.250	0.5412	0
16	63	12.250	0.5412	22.5
16	64	12.250	0.5412	45.0
16	65	12.250	0.5412	67.5
16	66	12.250	0.5412	90.0
16	67	12.250	0.5412	112.5
16	68	12.250	0.5412	135.0
16	69	12.250	0.5412	157.5
16	70	12.250	0.5412	180.0
17	71	12.500	0.5523	0
17	72	12.500	0.5523	180.0
18	73	16.400	0.7246	0
18	74	16.400	0.7246	180.0
19	75	16.650	0.7357	0
19	76	16.650	0.7357	180.0
20	77	16.900	0.7467	0
20	78	16.900	0.7467	45.0
20	79	16.900	0.7467	90.0
20	80	16.900	0.7467	135.0
20	81	16.900	0.7467	180.0
21	82	17.350	0.7666	0
21	83	17.350	0.7666	45.0
21	84	17.350	0.7666	90.0
21	85	17.350	0.7666	135.0
21	86	17.350	0.7666	180.0
22	87	17.600	0.7776	0
22	88	17.600	0.7776	180.0

Table I. THERMOCOUPLE LOCATION FOR MODEL A (Concluded)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
23	89	19.250	0.8505	0
23	90	19.250	0.8505	180.0
24	91	19.500	0.8616	0
24	92	19.500	0.8616	180.0
25	93	19.750	0.8726	0
25	94	19.750	0.8726	180.0
26	95	20.000	0.8837	0
26	96	20.000	0.8837	180.0
27	97	20.250	0.8947	0
27	98	20.250	0.8947	45.0
27	99	20.250	0.8947	90.0
27	100	20.250	0.8947	135.0
27	101	20.250	0.8947	180.0
28	102	20.500	0.9058	0
28	103	20.500	0.9058	180.0
29	104	21.000	0.9278	0
29	105	21.000	0.9278	45.0
29	106	21.000	0.9278	90.0
29	107	21.000	0.9278	135.0
29	108	21.000	0.9278	180.0
30	109	21.500	0.9499	0
30	110	21.500	0.9499	22.5
30	111	21.500	0.9499	45.0
30	112	21.500	0.9499	67.5
30	113	21.500	0.9499	90.0
30	114	21.500	0.9499	112.5
30	115	21.500	0.9499	135.0
30	116	21.500	0.9499	157.5
30	117	21.500	0.9499	180.0

Table II. THERMOCOUPLE LOCATION FOR MODEL B

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
1	1	0.600	0.0265	0
1	2	0.600	0.0265	90.0
1	3	0.600	0.0265	180.0
2	4	1.120	0.0495	0
2	5	1.120	0.0495	45.0
2	6	1.120	0.0495	90.0
2	7	1.120	0.0495	135.0
2	8	1.120	0.0495	180.0
3	9	2.200	0.0972	0
3	10	2.200	0.0972	22.5
3	11	2.200	0.0972	45.0
3	12	2.200	0.0972	67.5
3	13	2.200	0.0972	90.0
3	14	2.200	0.0972	112.5
3	15	2.200	0.0972	135.0
3	16	2.200	0.0972	157.5
3	17	2.200	0.0972	180.0
4	18	2.700	0.1193	0
4	19	2.700	0.1193	45.0
4	20	2.700	0.1193	90.0
4	21	2.700	0.1193	135.0
4	22	2.700	0.1193	180.0
5	23	2.950	0.1303	0
5	24	2.950	0.1303	180.0
6	25	4.050	0.1789	0
6	26	4.050	0.1789	180.0
7	27	4.300	0.1900	0
7	28	4.300	0.1900	22.5
7	29	4.300	0.1900	45.0
7	30	4.300	0.1900	67.5
7	31	4.300	0.1900	90.0
7	32	4.300	0.1900	112.5
7	33	4.300	0.1900	135.0
7	34	4.300	0.1900	157.5
7	35	4.300	0.1900	180.0
8	36	4.550	0.2010	0
8	37	4.550	0.2010	180.0
9	38	7.550	0.3336	0
9	39	7.550	0.3336	180.0

Note: Model Drawing No. 80M51355

Table II. THERMOCOUPLE LOCATION FOR MODEL B (Continued)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
10	40	7.800	0.3446	0
10	41	7.800	0.3446	22.5
10	42	7.800	0.3446	45.0
10	43	7.800	0.3446	67.5
10	44	7.800	0.3446	90.0
10	45	7.800	0.3446	112.5
10	46	7.800	0.3446	135.0
10	47	7.800	0.3446	157.5
10	48	7.800	0.3446	180.0
11	49	8.050	0.3557	0
11	50	8.050	0.3557	180.0
12	51	8.300	0.3667	0
12	52	8.300	0.3667	180.0
13	53	16.150	0.7136	0
13	54	16.150	0.7136	22.5
13	55	16.150	0.7136	45.0
13	56	16.150	0.7136	67.5
13	57	16.150	0.7136	90.0
13	58	16.150	0.7136	112.5
13	59	16.150	0.7136	135.0
13	60	16.150	0.7136	157.5
13	61	16.150	0.7136	180.0
14	62	16.400	0.7246	0
14	63	16.400	0.7246	180.0
15	64	16.650	0.7357	0
15	65	16.650	0.7357	180.0
16	66	16.900	0.7467	0
16	67	16.900	0.7467	45.0
16	68	16.900	0.7467	90.0
16	69	16.900	0.7467	135.0
16	70	16.900	0.7467	180.0
17	72	17.350	0.7666	0
17	71	17.350	0.7666	45.0
17	73	17.350	0.7666	90.0
17	74	17.350	0.7666	135.0
17	75	17.350	0.7666	180.0
18	76	17.600	0.7776	0
18	77	17.600	0.7776	180.0
19	78	19.250	0.8505	0
19	79	19.250	0.8505	180.0
20	80	19.500	0.8616	0
20	81	19.500	0.8616	180.0
21	82	19.750	0.8726	0
21	83	19.750	0.8726	180.0
22	84	20.000	0.8837	0
22	85	20.000	0.8837	180.0
23	86	20.250	0.8947	0
23	87	20.250	0.8947	45.0
23	88	20.250	0.8947	90.0
23	89	20.250	0.8947	135.0

Table II. THERMOCOUPLE LOCATION FOR MODEL B (Concluded)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
23	90	20.250	0.8947	180.0
24	91	20.500	0.9058	0
24	92	20.500	0.9058	180.0
25	93	21.000	0.9278	0
25	94	21.000	0.9278	45.0
25	95	21.000	0.9278	90.0
25	96	21.000	0.9278	135.0
25	97	21.000	0.9278	180.0
26	98	21.250	0.9389	0
26	99	21.250	0.9389	180.0
27	100	21.500	0.9499	0
27	101	21.500	0.9499	22.5
27	102	21.500	0.9499	45.0
27	103	21.500	0.9499	67.5
27	104	21.500	0.9499	90.0
27	105	21.500	0.9499	112.5
27	106	21.500	0.9499	135.0
27	107	21.500	0.9499	157.5
27	108	21.500	0.9499	180.0
28	109	21.994	0.9718	0
28	110	21.994	0.9718	45.0
28	111	21.994	0.9718	90.0
28	112	21.994	0.9718	135.0
28	113	21.994	0.9718	180.0
29	114	22.200	0.9809	0
29	115	22.200	0.9809	45.0
29	116	22.200	0.9809	90.0
29	117	22.200	0.9809	135.0
29	118	22.200	0.9809	180.0

Table III. THERMOCOUPLE LOCATION FOR MODEL C

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
1	1	2.761	0.1220	0
1	2	2.761	0.1220	180.0
2	3	3.012	0.1331	0
2	4	3.012	0.1331	45.0
2	5	3.012	0.1331	90.0
2	6	3.012	0.1331	135.0
2	7	3.012	0.1331	180.0
3	8	3.262	0.1441	0
3	9	3.262	0.1441	180.0
4	10	4.062	0.1795	0
4	11	4.062	0.1795	180.0
5	12	4.312	0.1905	0
5	13	4.312	0.1905	45.0
5	14	4.312	0.1905	90.0
5	15	4.312	0.1905	135.0
5	16	4.312	0.1905	180.0
6	18	4.562	0.2016	0
6	17	4.562	0.2016	180.0
7	19	7.462	0.3297	0
7	20	7.462	0.3297	180.0
8	21	7.712	0.3407	0
8	22	7.712	0.3407	45.0
8	23	7.712	0.3407	90.0
8	24	7.712	0.3407	135.0
8	25	7.712	0.3407	180.0
9	26	7.962	0.3518	0
9	27	7.962	0.3518	180.0
10	28	9.512	0.4203	0
10	29	9.512	0.4203	180.0
11	30	9.762	0.4203	0
11	31	9.762	0.4203	45.0
11	32	9.762	0.4203	90.0
11	33	9.762	0.4203	135.0
11	34	9.762	0.4203	180.0
12	35	10.012	0.4424	0
12	36	10.012	0.4424	180.0
13	37	12.002	0.5303	0
13	38	12.002	0.5303	180.0
14	39	12.252	0.5413	0
14	40	12.252	0.5413	22.5
14	41	12.252	0.5413	45.0

Note: Model Drawing No. 80M51356

Table III. THERMOCOUPLE LOCATION FOR MODEL C (Continued)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
14	42	12.252	0.5413	7.5
14	43	12.252	0.5413	90.0
14	44	12.252	0.5413	112.5
14	45	12.252	0.5413	135.0
14	46	12.252	0.5413	157.5
14	47	12.252	0.5413	180.0
15	48	12.502	0.5524	0
15	49	12.502	0.5524	180.0
16	50	16.412	0.7251	0
16	51	16.412	0.7251	22.5
16	52	16.412	0.7251	45.0
16	53	16.412	0.7251	67.5
16	54	16.412	0.7251	90.0
16	55	16.412	0.7251	112.5
16	56	16.412	0.7251	135.0
16	57	16.412	0.7251	157.5
16	58	16.412	0.7251	180.0
17	59	16.662	0.7362	0
17	60	16.662	0.7362	180.0
18	61	16.912	0.7472	0
18	62	16.912	0.7472	45.0
18	63	16.912	0.7472	90.0
18	64	16.912	0.7472	135.0
18	65	16.912	0.7472	180.0
19	66	17.352	0.7667	0
19	67	17.352	0.7667	45.0
19	68	17.352	0.7667	90.0
19	69	17.352	0.7667	135.0
19	70	17.352	0.7667	180.0
20	71	17.602	0.7777	0
20	72	17.602	0.7777	180.0
21	73	19.252	0.8506	0
21	74	19.252	0.8506	180.0
22	75	19.502	0.8617	0
22	76	19.502	0.8617	180.0
23	77	19.752	0.8727	0
23	78	19.752	8727	180.0
24	79	20.002	0.8838	0
24	80	20.002	0.8838	180.0
25	81	20.252	0.8948	0
25	82	20.252	0.8948	22.5
25	83	20.252	0.8948	45.0
25	84	20.252	0.8948	67.5
25	85	20.252	0.8948	90.0
25	86	20.252	0.8948	112.5
25	87	20.252	0.8948	135.0
25	88	20.252	0.8948	157.5
25	89	20.252	0.8948	180.0

Table III. THERMOCOUPLE LOCATION FOR MODEL C (Concluded)

Station Number	Thermocouple Number	X (inches)	X/L	θ (deg)
26	90	20.502	0.9058	0
26	91	20.502	0.9058	180.0
27	92	20.972	0.9266	0
27	93	20.972	0.9266	45.0
27	94	20.972	0.9266	90.0
27	95	20.972	0.9266	135.0
27	96	20.972	0.9266	180.0
28	97	21.222	0.9377	0
28	109	21.222	0.9377	180.0
29	99	21.472	0.9487	0
29	100	21.472	0.9487	22.5
29	101	21.472	0.9487	45.0
29	102	21.472	0.9487	67.5
29	103	21.472	0.9487	90.0
29	104	21.472	0.9487	112.5
29	105	21.472	0.9487	135.0
29	106	21.472	0.9487	157.5
29	107	21.472	0.9487	180.0
30	108	22.012	0.9726	0
30	98	22.012	0.9726	45.0
30	110	22.012	0.9726	90.0
30	111	22.012	0.9726	135.0
30	112	22.012	0.9726	180.0
31	113	22.202	0.9810	0
31	114	22.202	0.9810	22.5
31	115	22.202	0.9810	45.0
31	116	22.202	0.9810	67.5
31	117	22.202	0.9810	90.0
31	118	22.202	0.9810	112.5
31	119	22.202	0.9810	135.0
31	120	22.202	0.9810	157.5
31	121	22.202	0.9810	180.0

TABLE IV.

TEST: UPWT 1115 (SH12F) — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE: 11/10/74

DATA SET IDENTIFIER	CONFIGURATION	SCHD. M	SCHD. β	PARAMETERS/VALUES RN/L	PARAMETERS/VALUES MODEL	NO. OF RUNS	ALPHA 0	ALPHA 8	ALPHA 15	ALPHA 30	ALPHA 35	ALPHA 40	TEST RUN NUMBERS
RHA001	SRB w/TRIP	3.7	0	3.5	1		16	17	18				
2	SRB wo/TRIP+RING									23	25	24	
3	"			↓						26			
4	SRB wo/TRIP			1.5			5	6	7	12		13	
5	"	↓	↓	3.5	↓		2	3	4	10		11	

1 7 13 19 25 31 37 43 49 55 61 67 75 76

H/HREF COEFFICENTS IDVAR (1) IDVAR (2) NDV

α OR β SCHEDULES

TABLE IV. (Continued)

TEST: UPWT 1115 (SH12F) DATA SET/RUN NUMBER COLLATION SUMMARY DATE: 11/10/74

DATA SET IDENTIFIER	CONFIGURATION	SCHD. M	SCHD. β	PARAMETERS/VALUES RN/L	PARAMETERS/VALUES MODEL	NO. OF RUNS	ALPHA 60	75	90	105	120	TEST RUN NUMBERS
RHA006	SRB wo/TRIP	3.7	0	1.5	2		45	46	47	53	52	
7	↓	↓	↓	3.5	↓		42	43	44	50	51	
8	↓	↓	↓	3.5	↓		63	64	65			

1 7 13 19 25 31 37 43 49 55 61 67 75 76

COEFFICENTS IDVAR (1) IDVAR (2) NDV

α OR β SCHEDULES

TABLE IV. (Concluded)

TEST: UPWT 1115 (SH12F) — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE: 11/10/74

DATA SET IDENTIFIER	CONFIGURATION	SCHD. M	SCHD. β	PARAMETERS/VALUES RN/L	PARAMETERS/VALUES MODEL	NO. OF RUNS	ALPHA 140	ALPHA 150	ALPHA 160	ALPHA 170	ALPHA 180	TEST RUN NUMBERS
RHA009	SRB w/o/TRIP	3.7	0	1.5	3		38	39		31	32	
RHA010	"	3.7	0	3.5	3		37	36	35	30	29	

1 7 13 19 25 31 37 43 49 55 61 67 75 76

COEFFICENTS — IDVAR (1) — IDVAR (2) — NDV

α OR β SCHEDULES

TABLE V. MATERIAL PROPERTIES OF THIN SKIN MODELS

Material --------- Steel 17-4 PH H 900

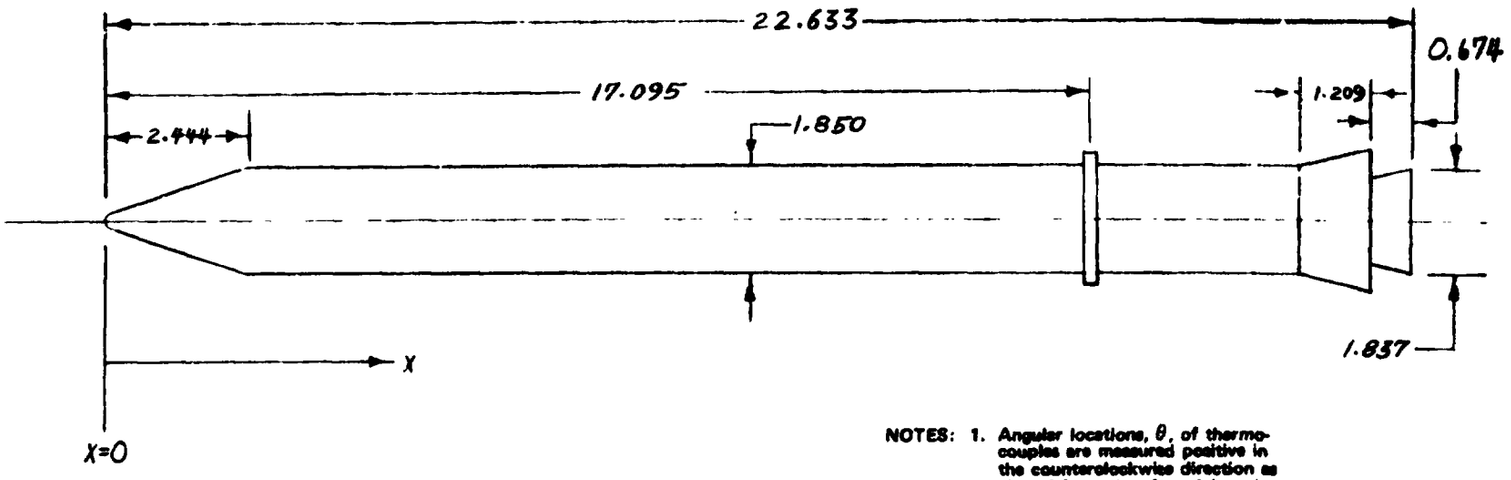
Thermal Conductivity, k = 9.8 Btu/hr/sq. ft./ft./F (212 F)

Specific Heat, C = 0.11 Btu/lb/F (32-212 F)

Specific Weight = 0.281 lb/cu. in.

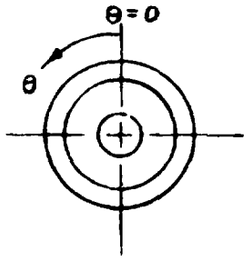
* Skin Thickness, b = 0.030 in.

* Note: The exact skin thickness at each thermocouple location was measured. The average skin thickness is 0.030 inch.



NOTES: 1. Angular locations, θ, of thermocouples are measured positive in the counterclockwise direction as viewed from the aft end (nozzle end) of the SRB.

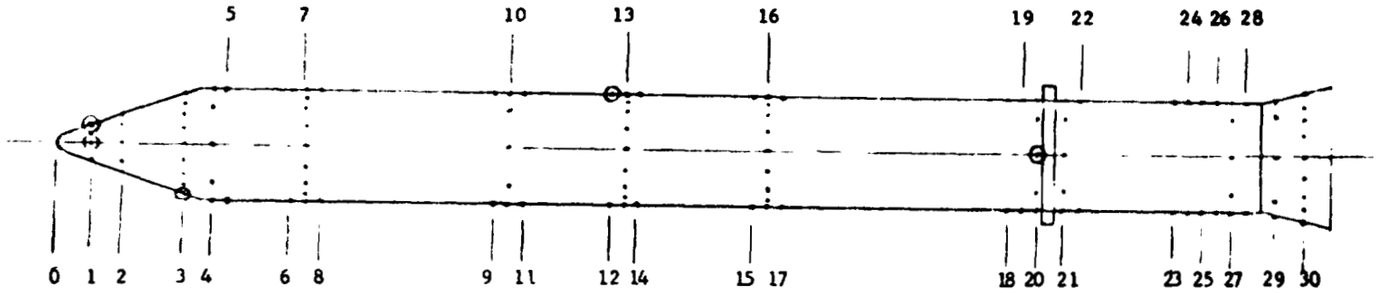
2. All dimensions are in inches.



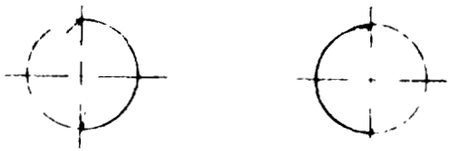
AFT END VIEW

Figure 1. SCHEMATIC OF SRB WIND TUNNEL MODEL

NOTE: Five inoperative thermocouples have been circled: 1, 2, 17, 47, 79

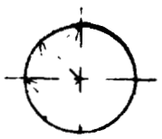


These cross sections show thermocouple locations at the indicated stations looking forward (not to scale).

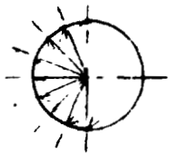


Stations 5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 19, 22, 23, 24, 25, 26, & 28.

Station 1.



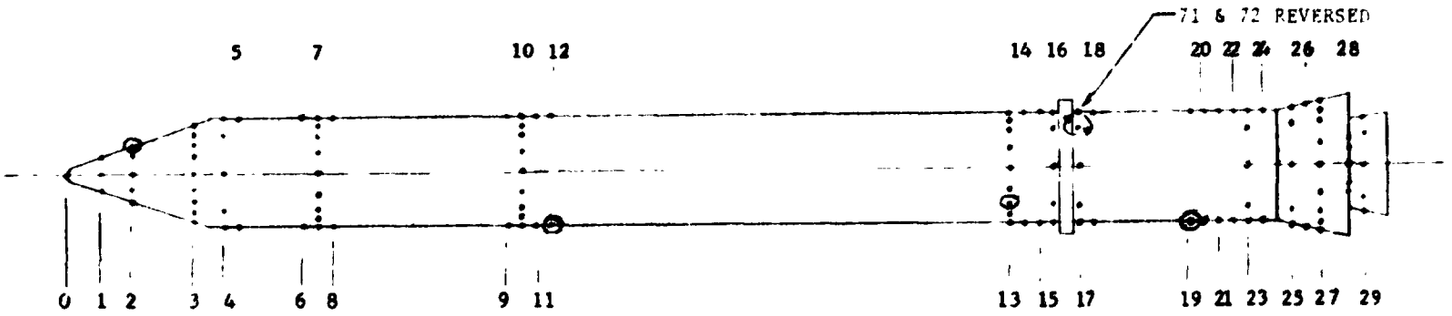
Stations 2, 4, 10, 20, 21, 27 & 29.



Stations 3, 7, 13, 16 & 30.

Figure 2(a). - SCHEMATIC OF MODEL A SHOWING THERMOCOUPLE LOCATIONS

NOTE: Four inoperative thermocouples have been circled: 4, 52, 59, 79



These cross sections show thermocouple locations at the indicated stations looking forward (not to scale).

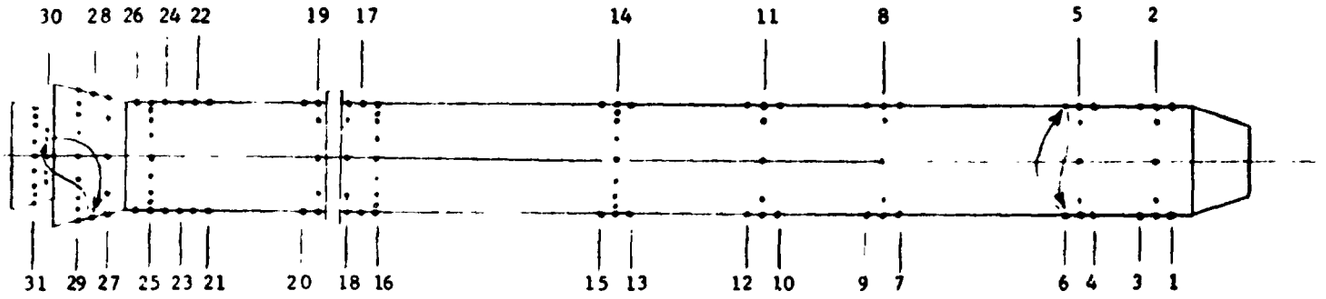
Stations 5, 6, 8, 9, 11, 12, 14, 15, 18, 19, 20, 21, 22, 24 & 26.

Station 1.

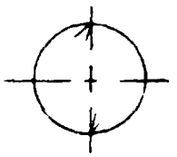
Stations 2, 4, 16, 17, 23, 25, 28 & 29.

Stations 3, 7, 10, 13 & 27.

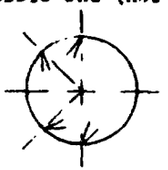
Figure 2(b).- SCHEMATIC OF MODEL B SHOWING THERMOCOUPLE LOCATIONS



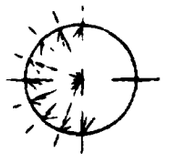
These cross sections show thermocouple locations at the indicated stations looking from the nozzle end (not to scale).



Stations 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 17, 20, 21, 22, 23, 24, 26, & 28.



Stations 2, 5, 8, 11, 18, 19, 27, & 30.



Stations 14, 16, 25, 29, & 31.

Figure 2(c).- SCHEMATIC OF MODEL C SHOWING THERMOCOUPLE LOCATIONS

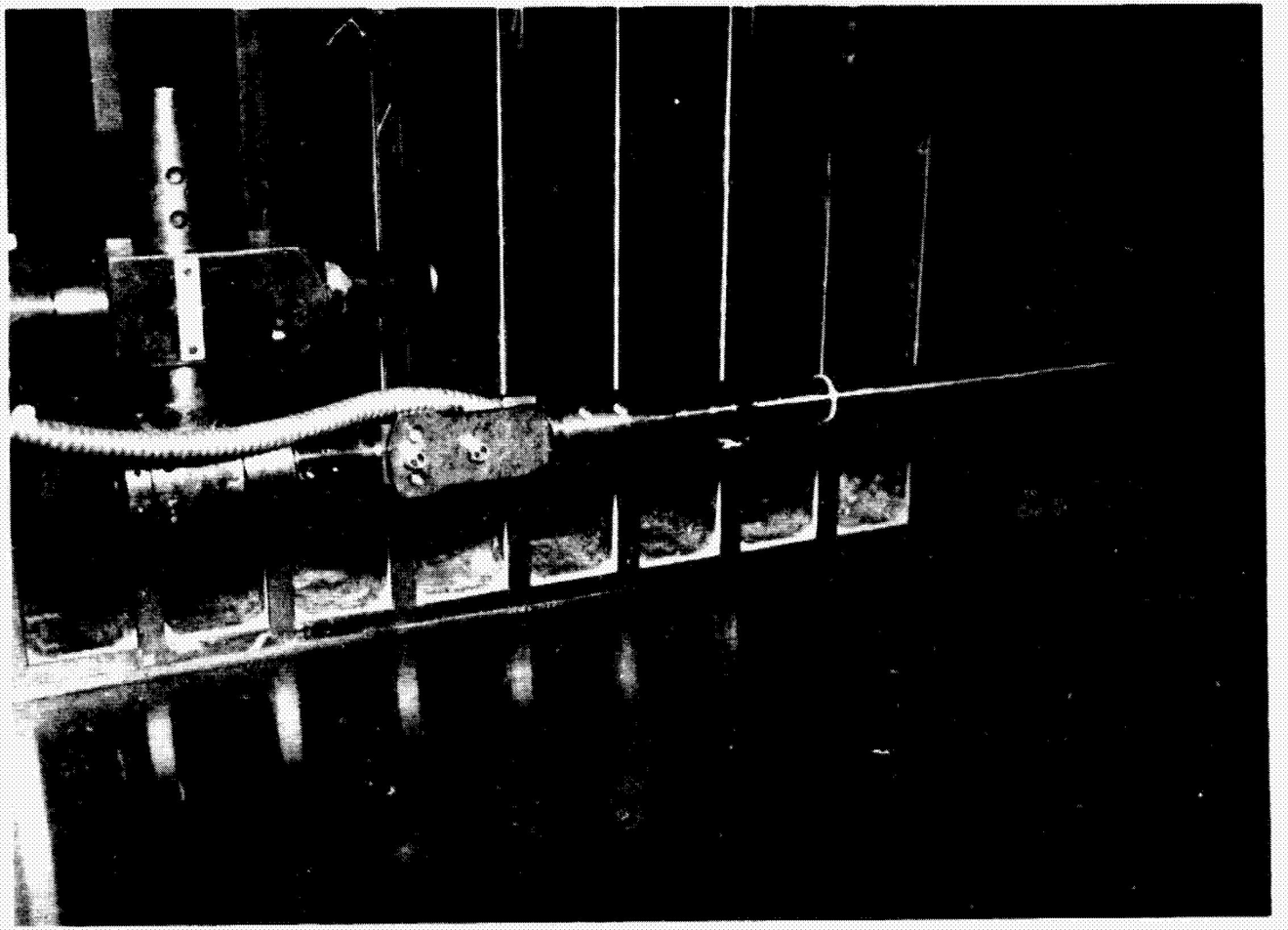


Figure 3(a). - MODEL A INSTALLED IN TEST SECTION

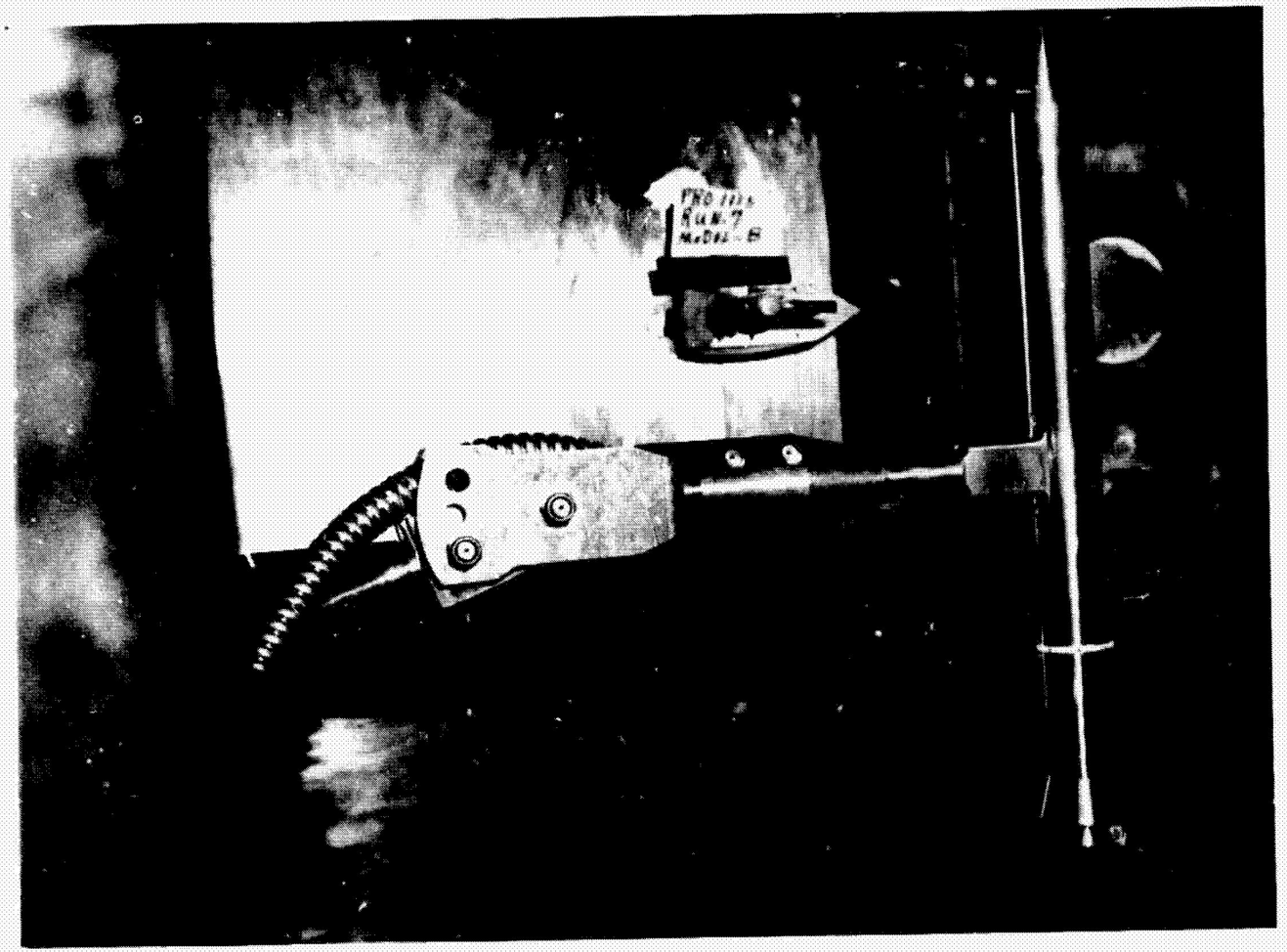


Figure 3(b). - MODEL B INSTALLED IN TEST SECTION

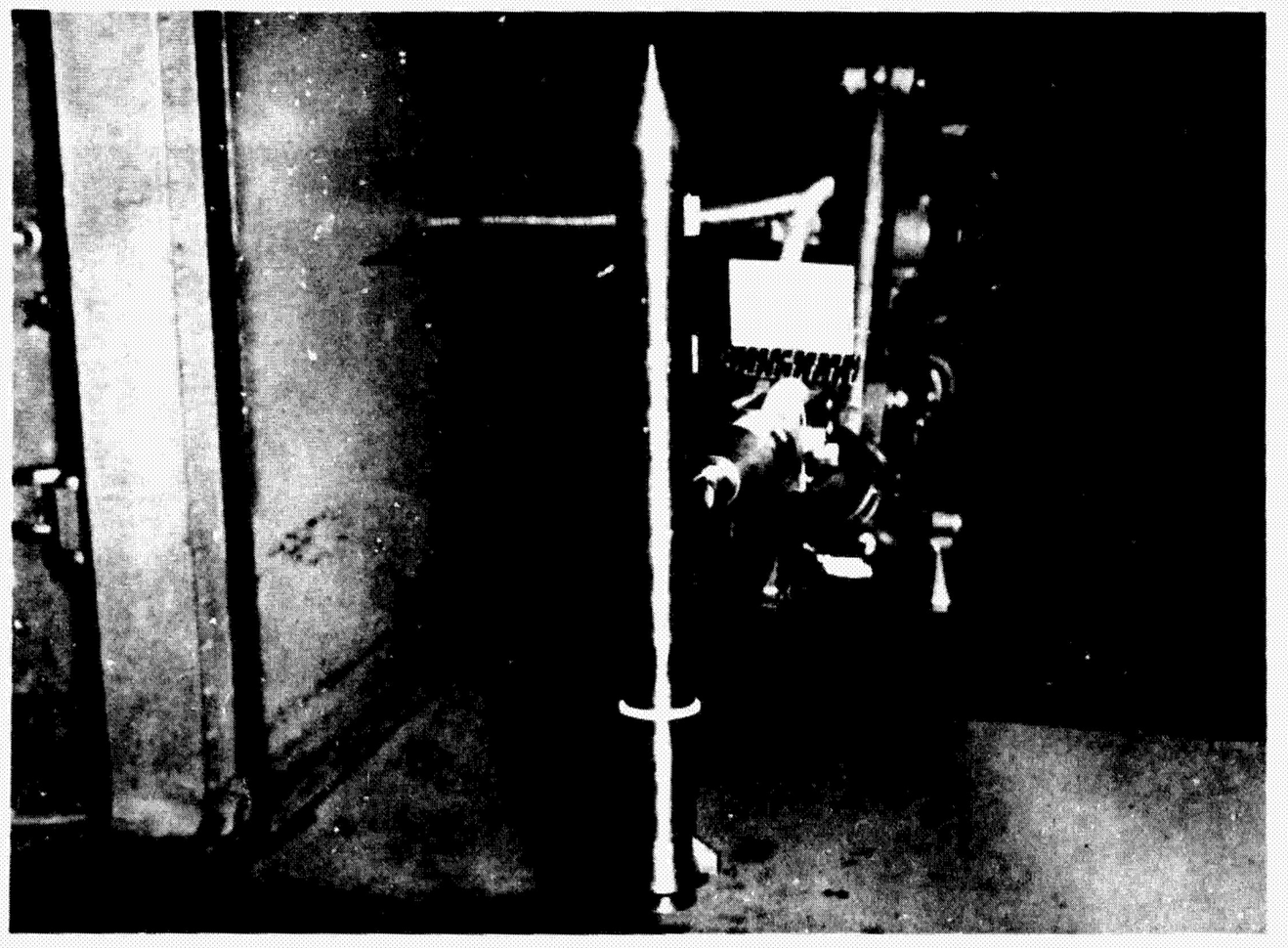


Figure 3(c). - MODEL B WITH PROTUBERANCES INSTALLED IN TEST SECTION

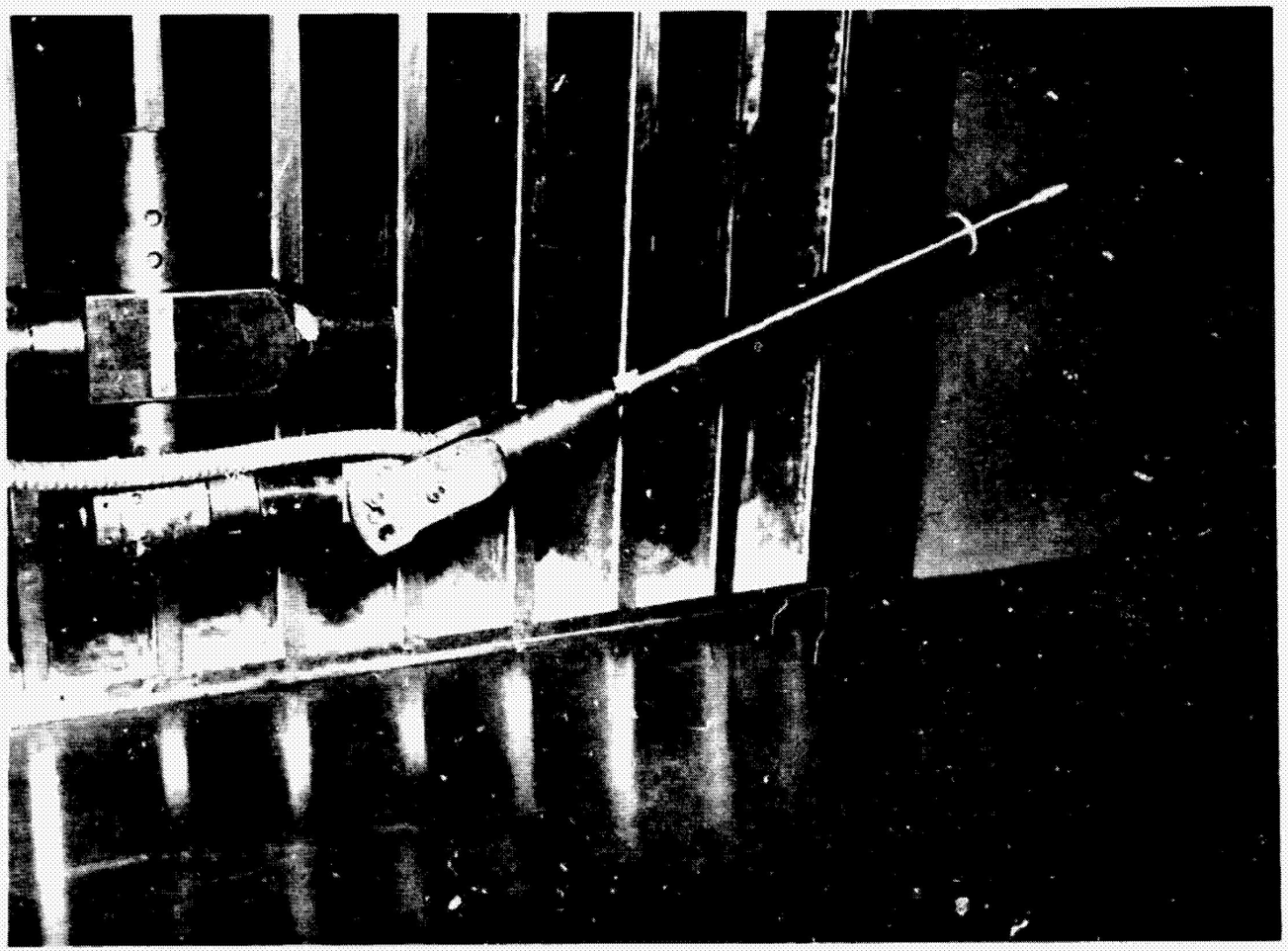


Figure 3(d). - MODEL C INSTALLED IN TEST SECTION

DATA FIGURES

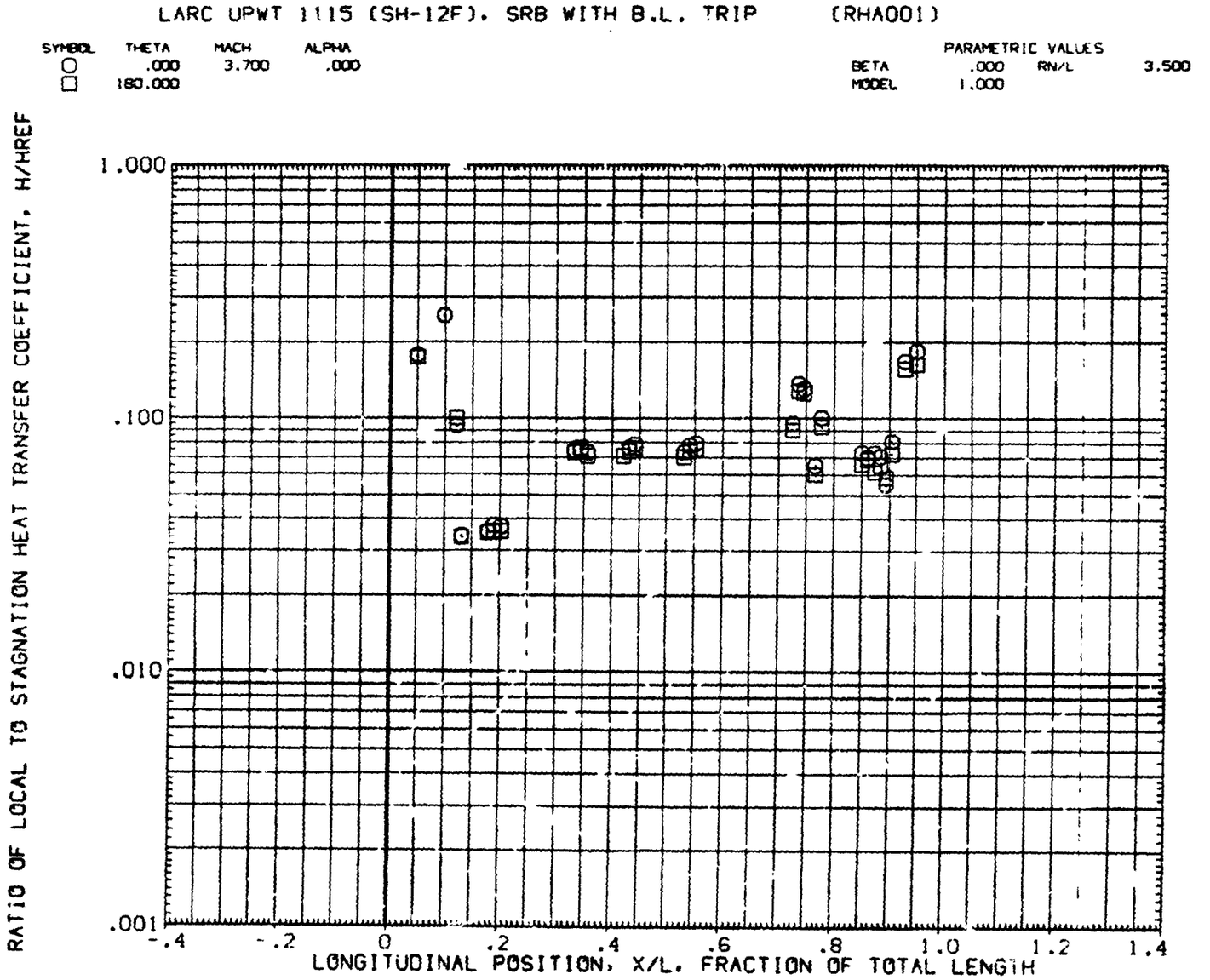


FIGURE 4 H/HREF ALONG TOP AND BOTTOM CENTERLINE (WITH BOUNDRY LAYER TRIP)

LARC UPWT 1115 (SH-12F). SRB WITH B.L. TRIP (RHA001)

SYMBOL	THETA	MACH	ALPHA
○	.000	3.700	8.000
□	180.000		

PARAMETRIC VALUES

BETA	.000	RN/L	3.500
MODEL	1.000		

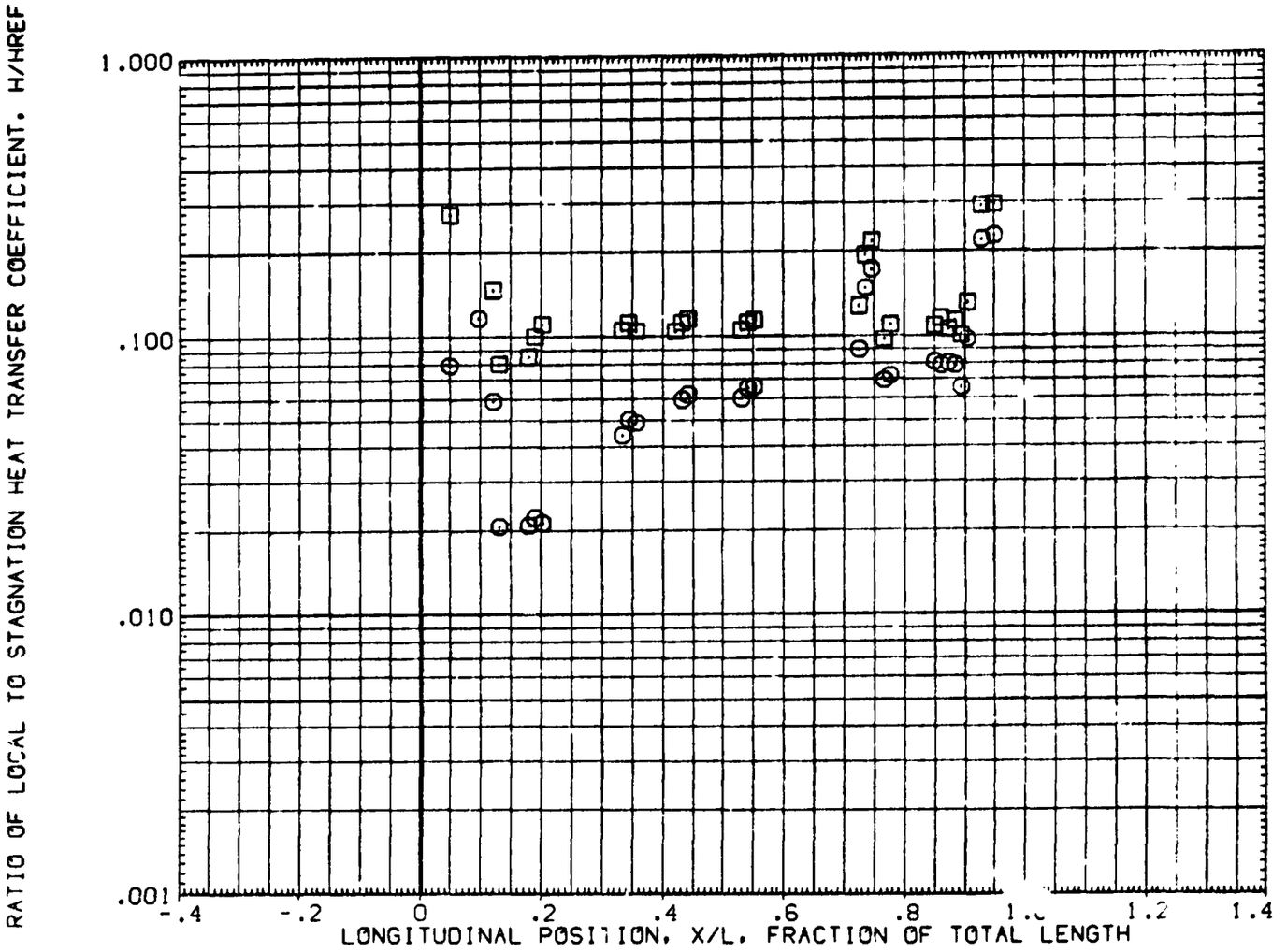


FIGURE 4 H/HREF ALONG TOP AND BOTTOM CENTERLINE (WITH BOUNDRY LAYER TRIP)

LARC UPWT 1115 (SH-12F). SRB WITH B.L. TRIP (RHA001)

SYMBOL	THETA	MACH	ALPHA
○	.000	3.700	15.000
□	180.000		

PARAMETRIC VALUES

BETA	.000	RN/L	3.500
MODEL	1.000		

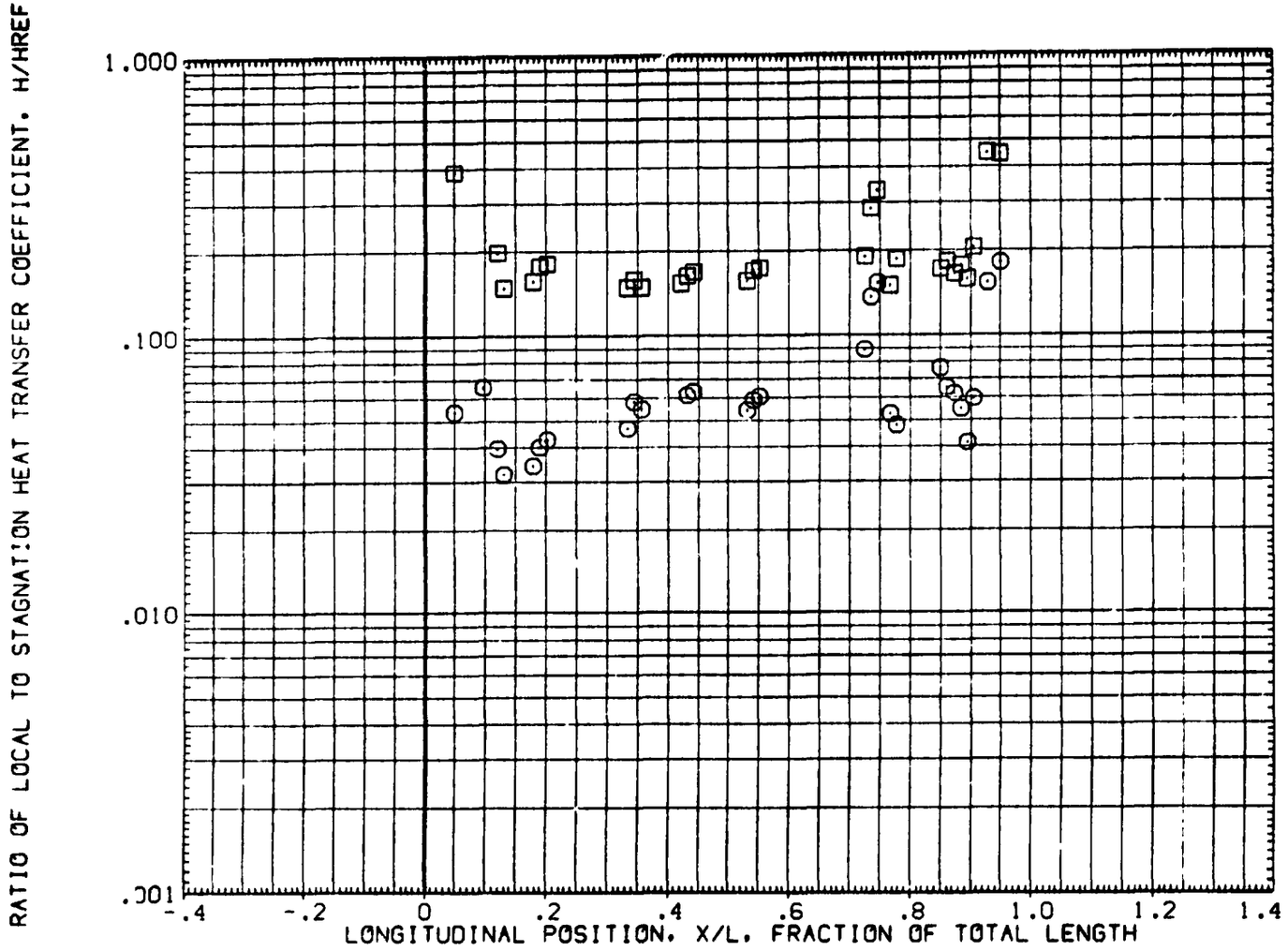


FIGURE 4 H/HREF ALONG TOP AND BOTTOM CENTERLINE (WITH BOUNDRY LAYER TRIP)

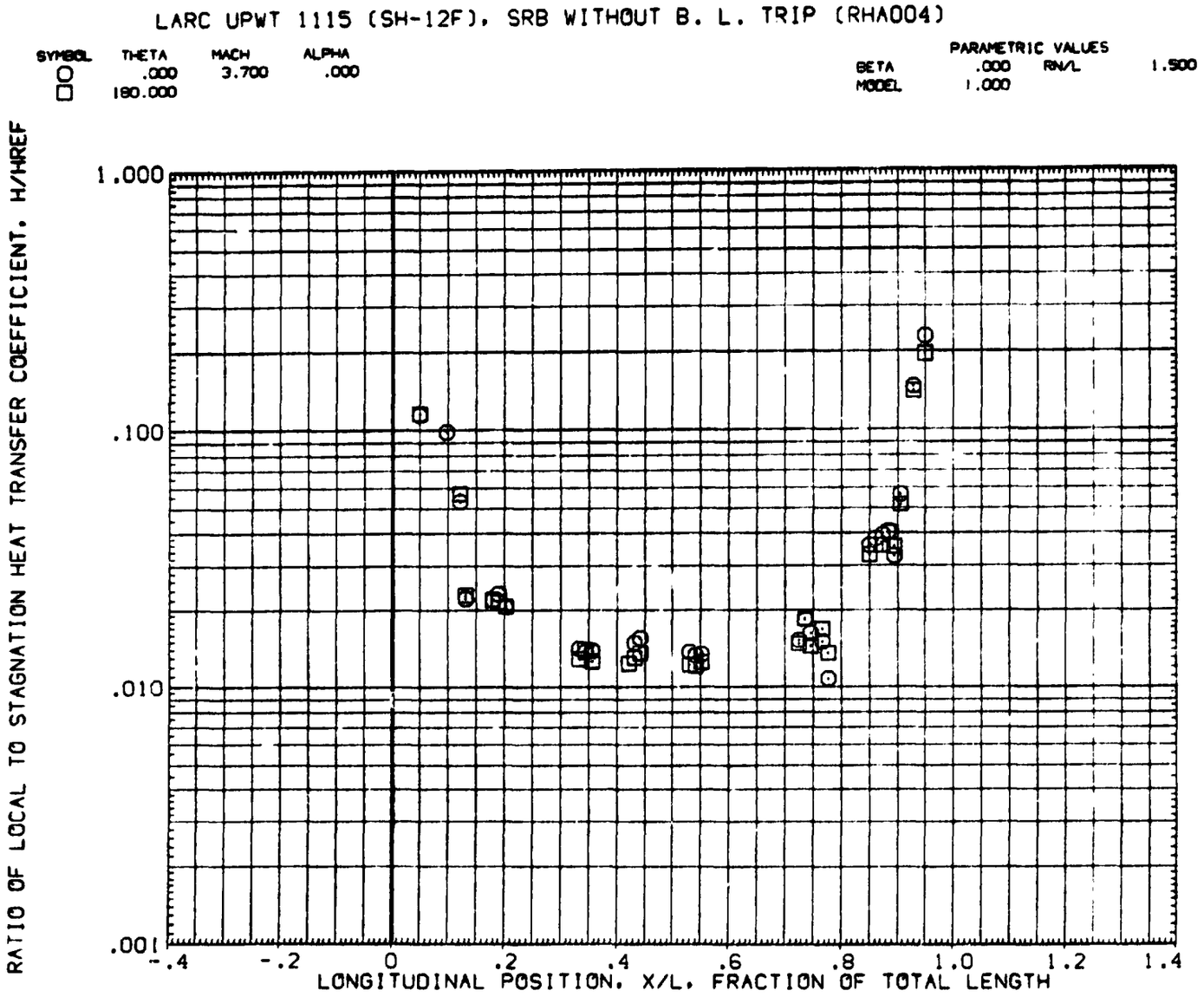


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

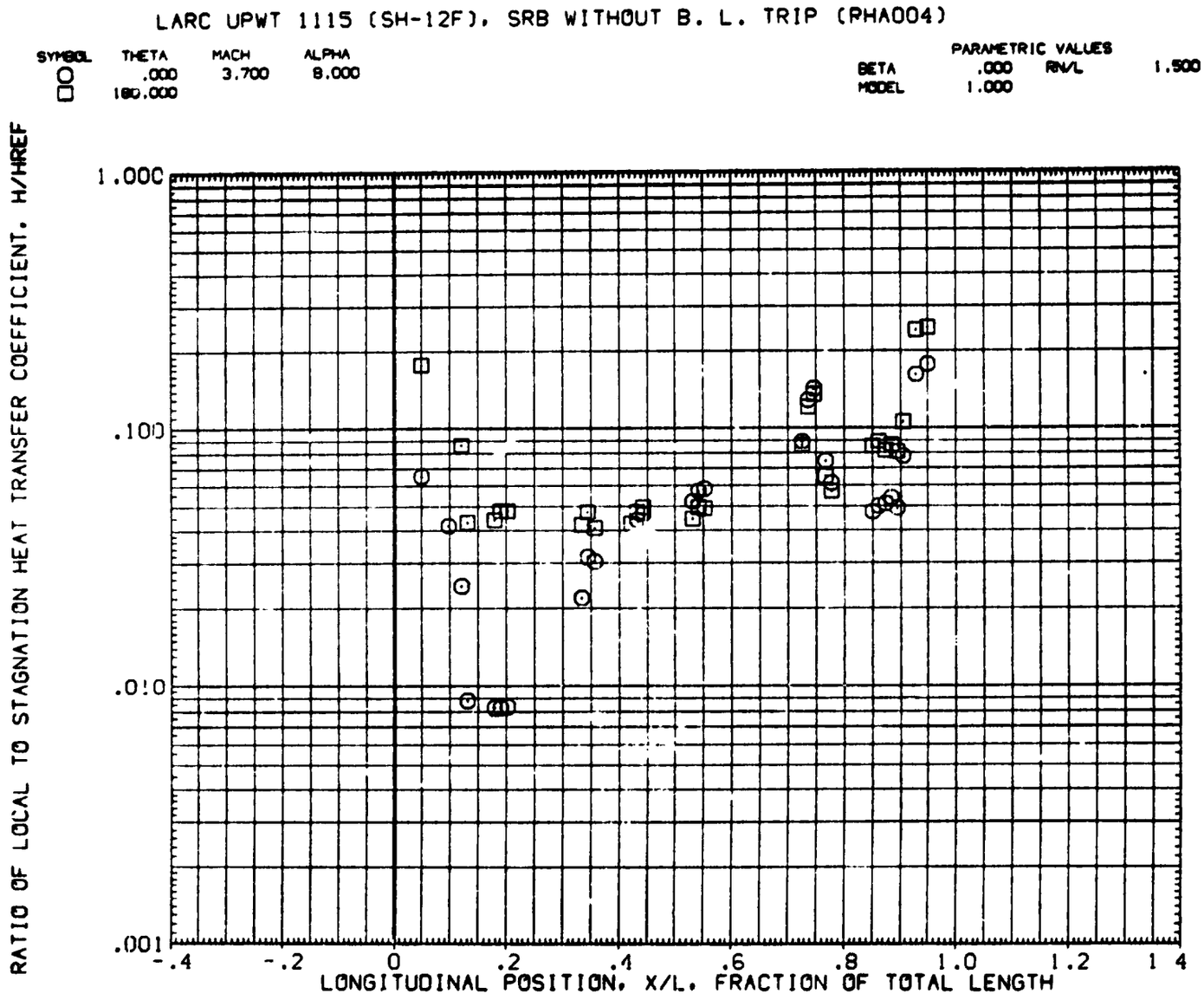


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

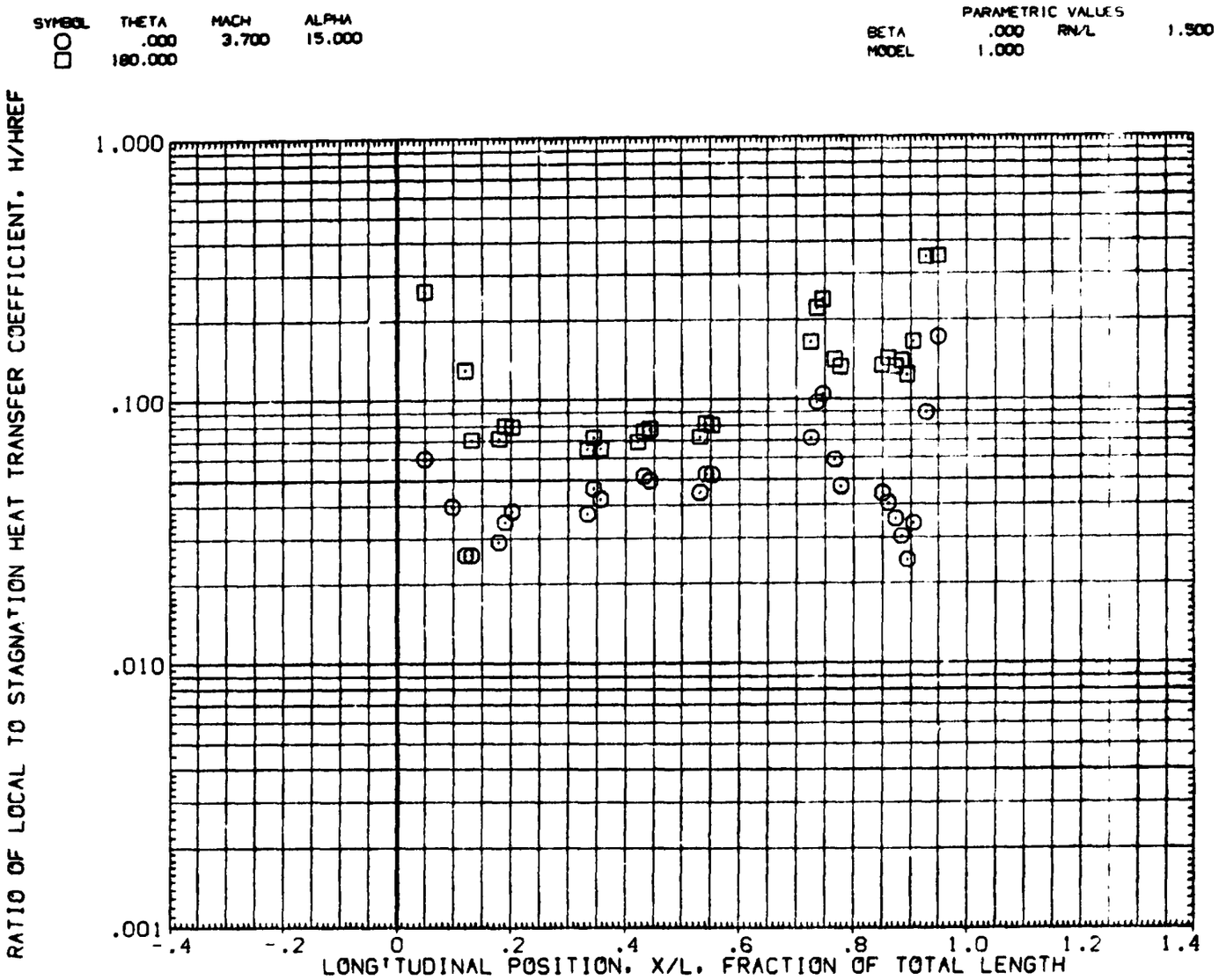


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

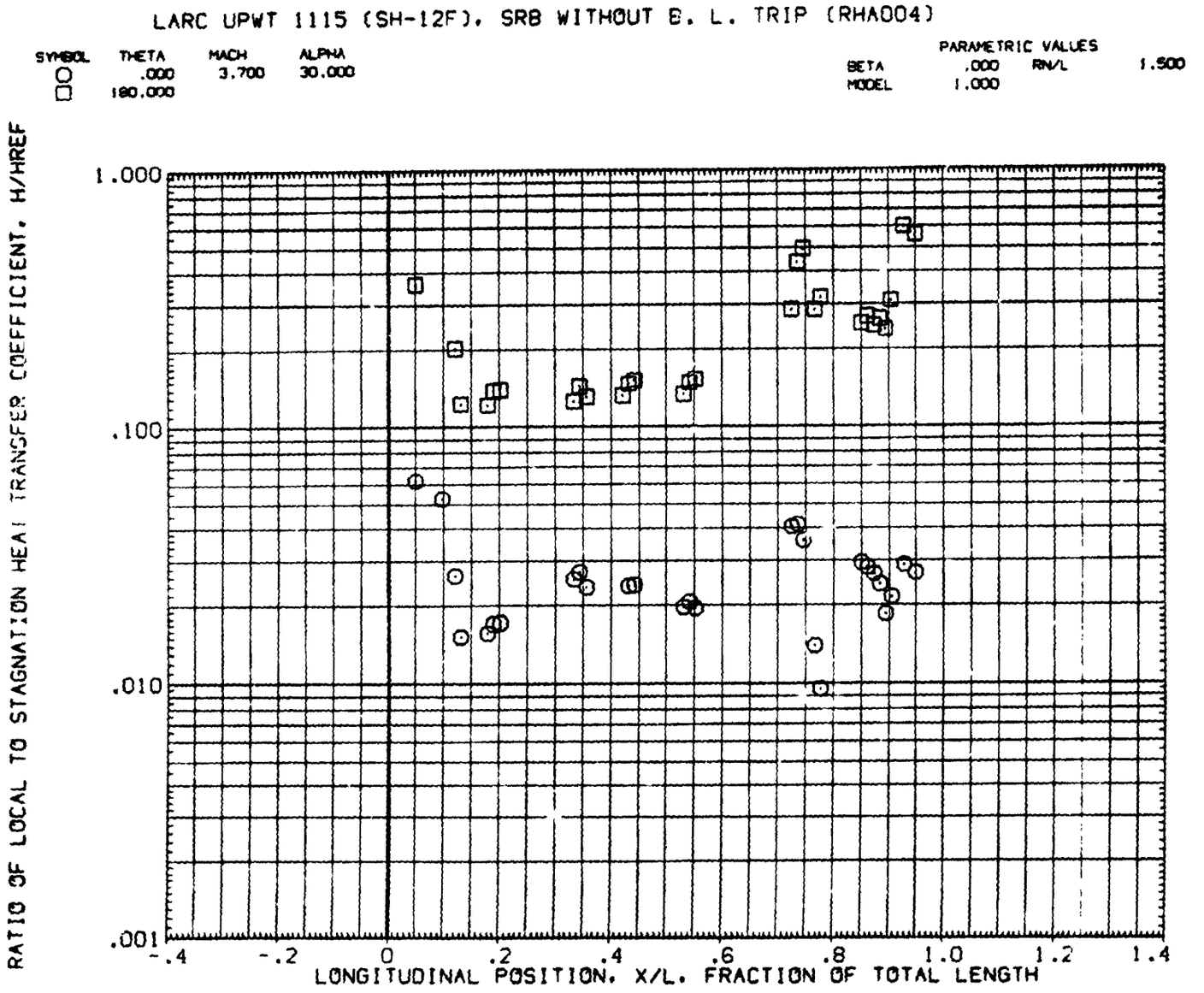


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

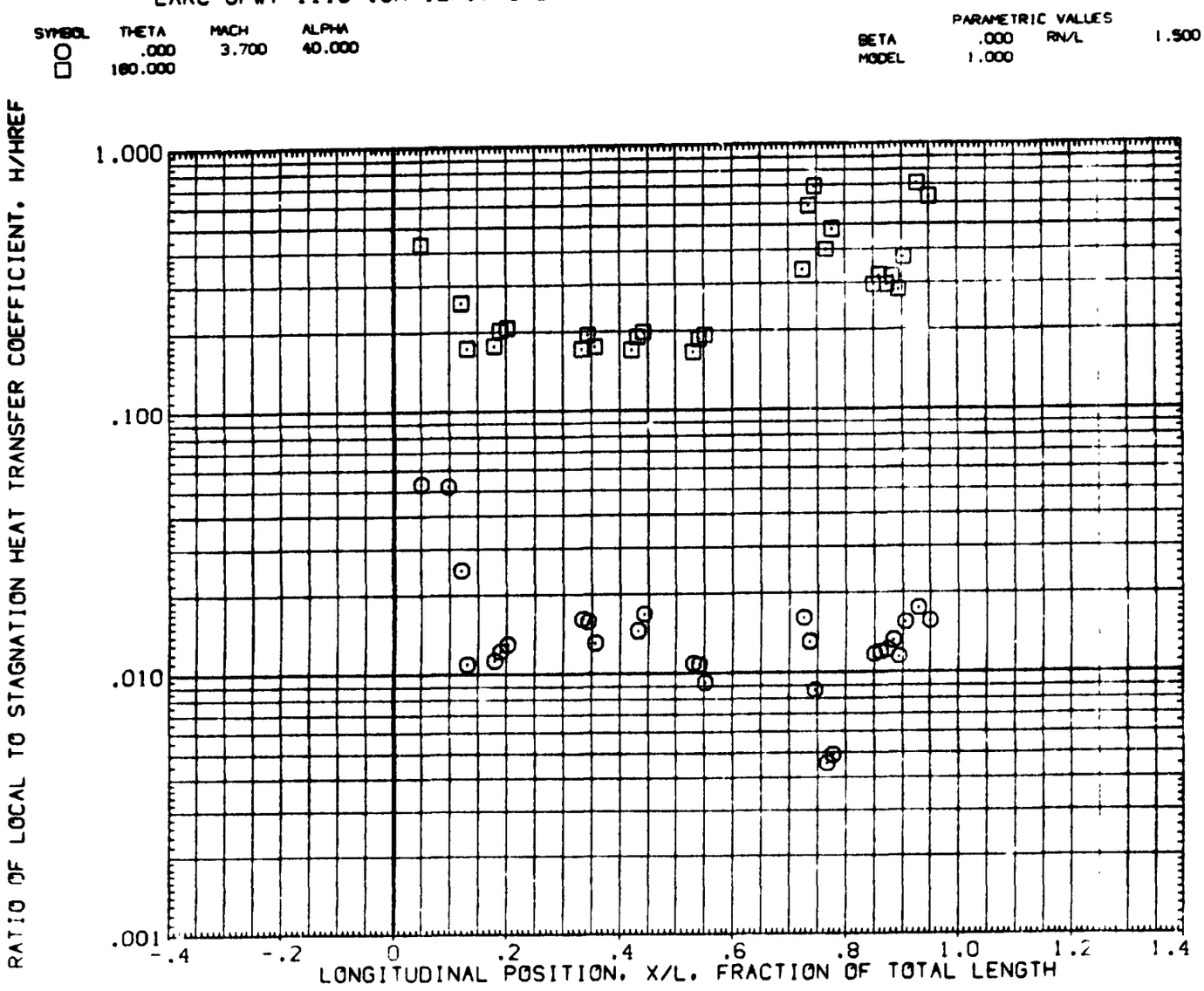


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

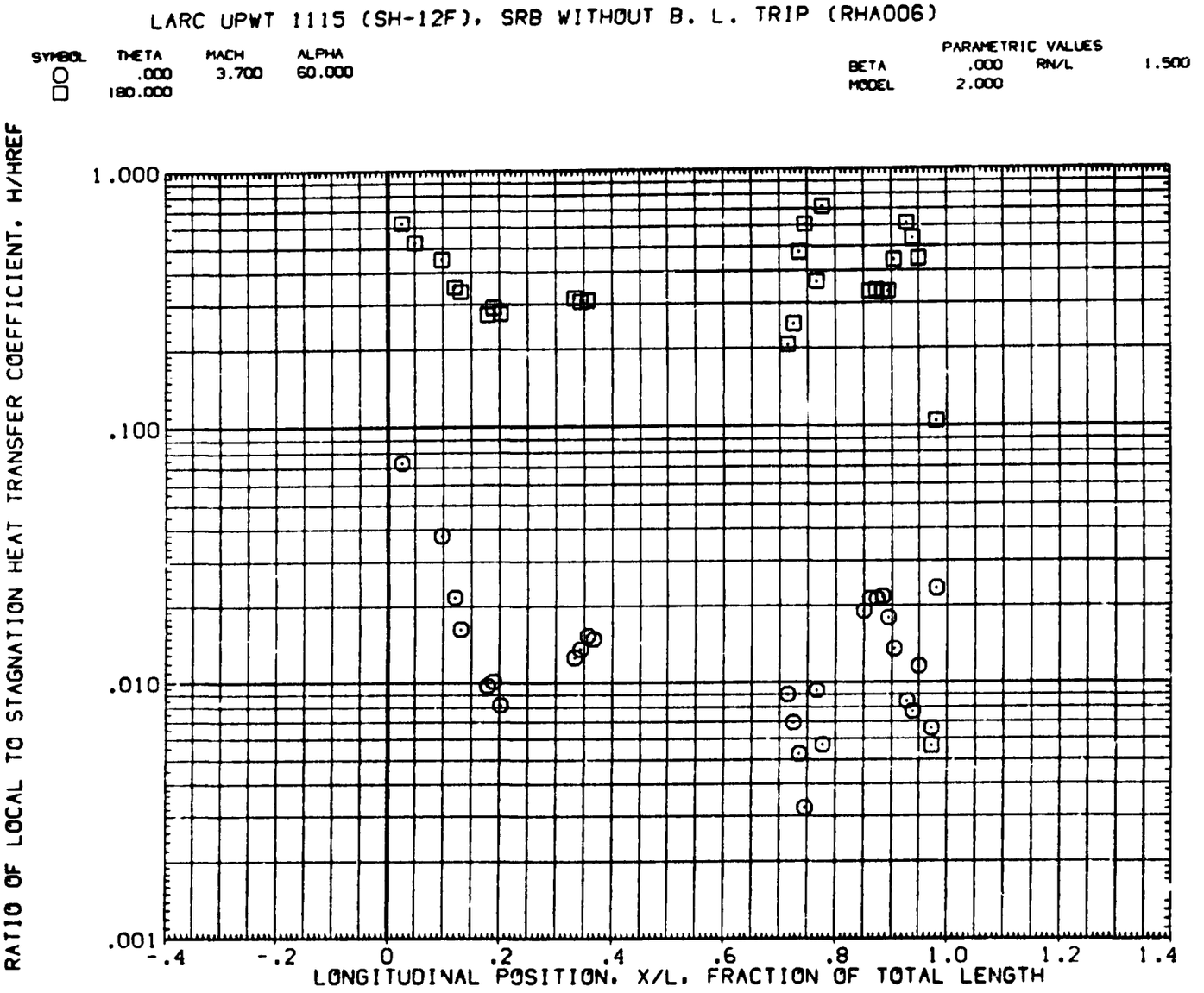


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

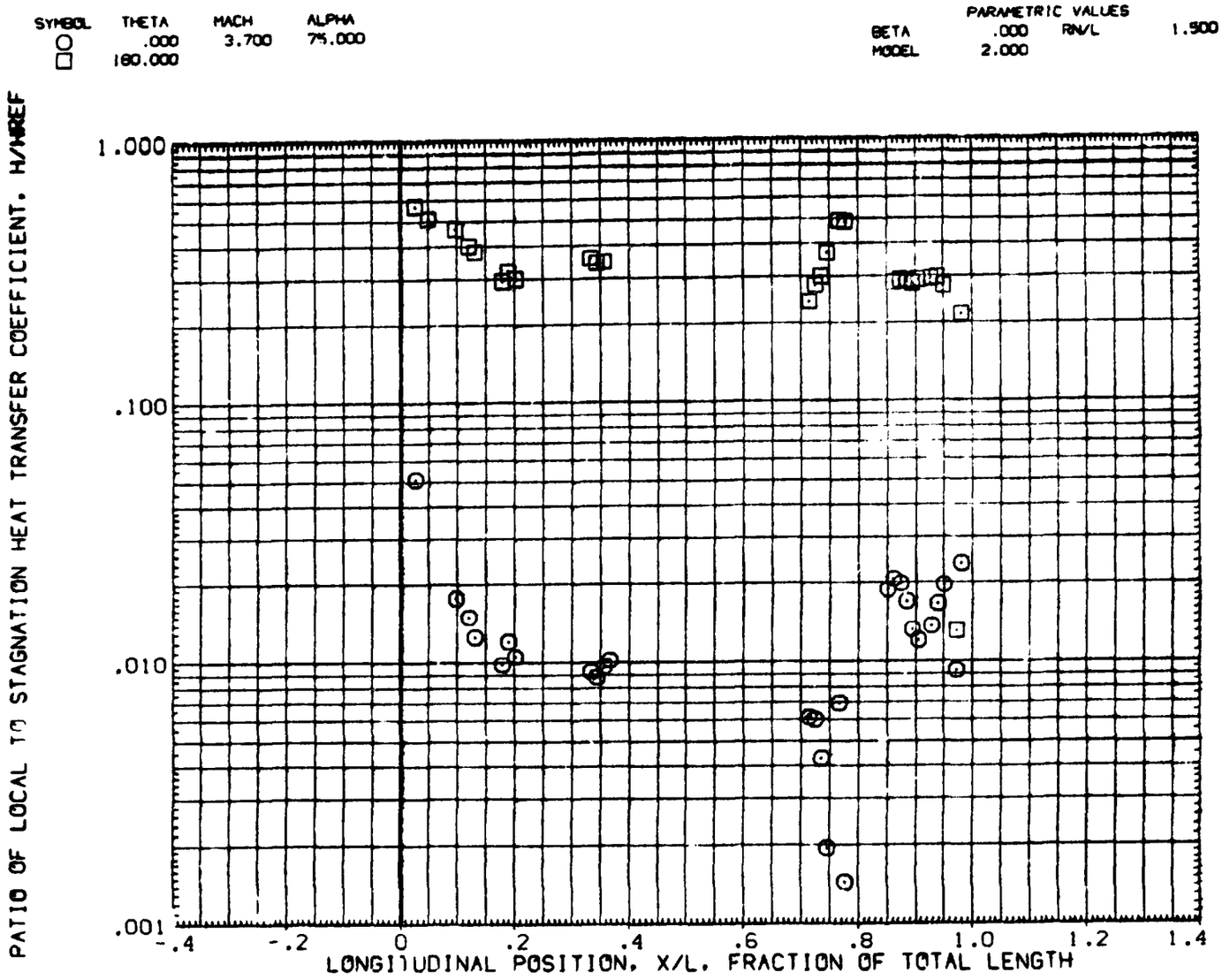


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

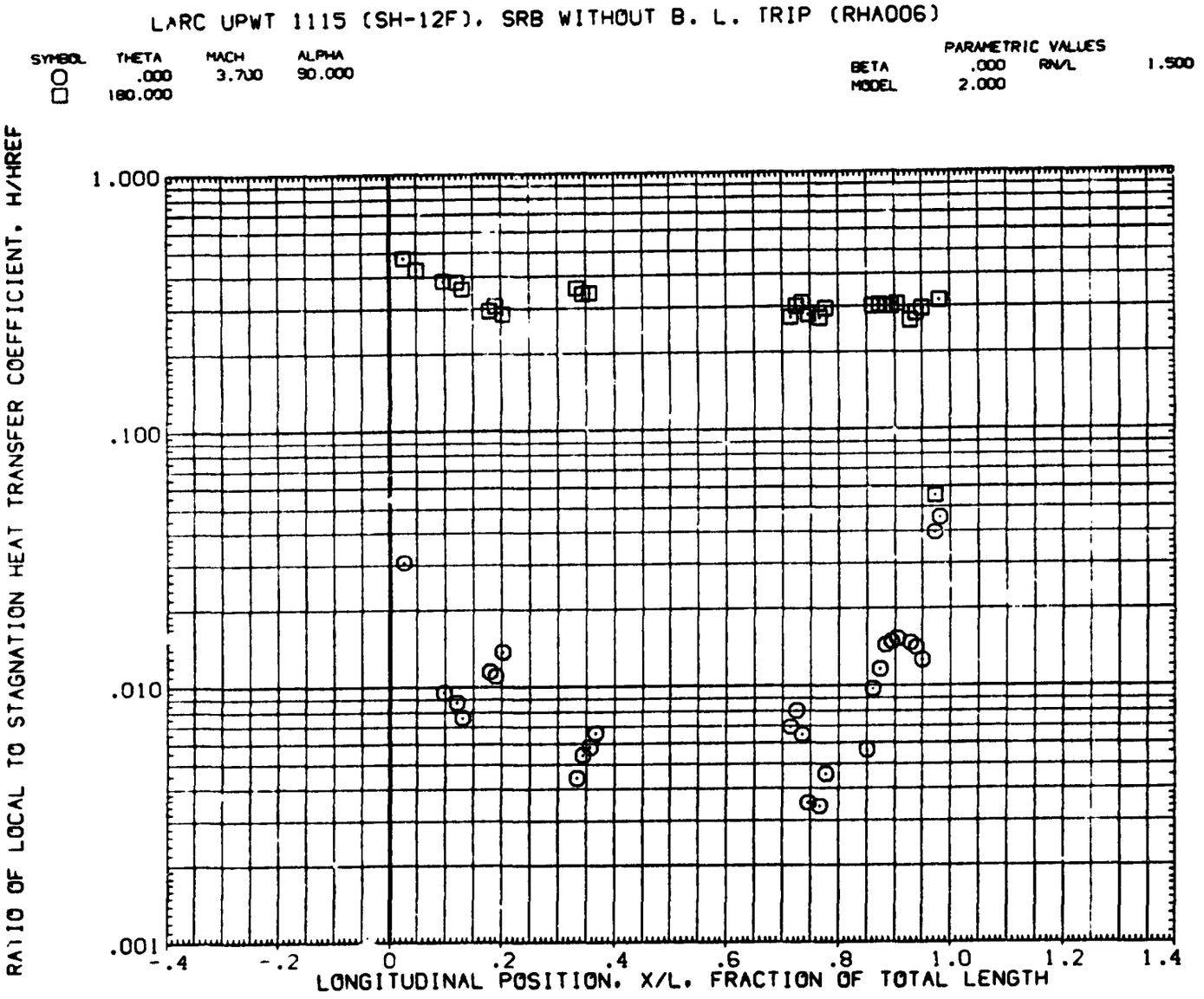


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

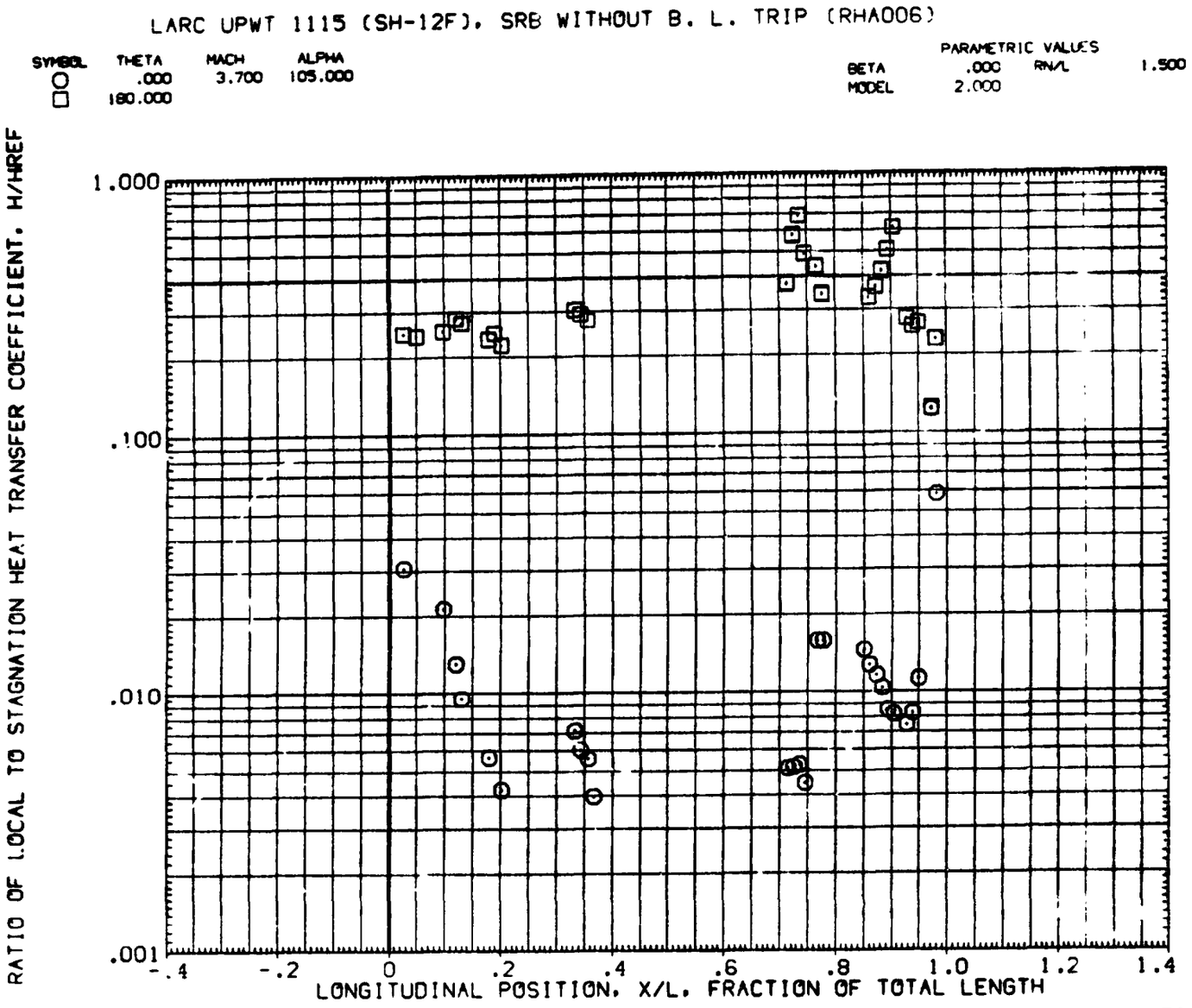


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

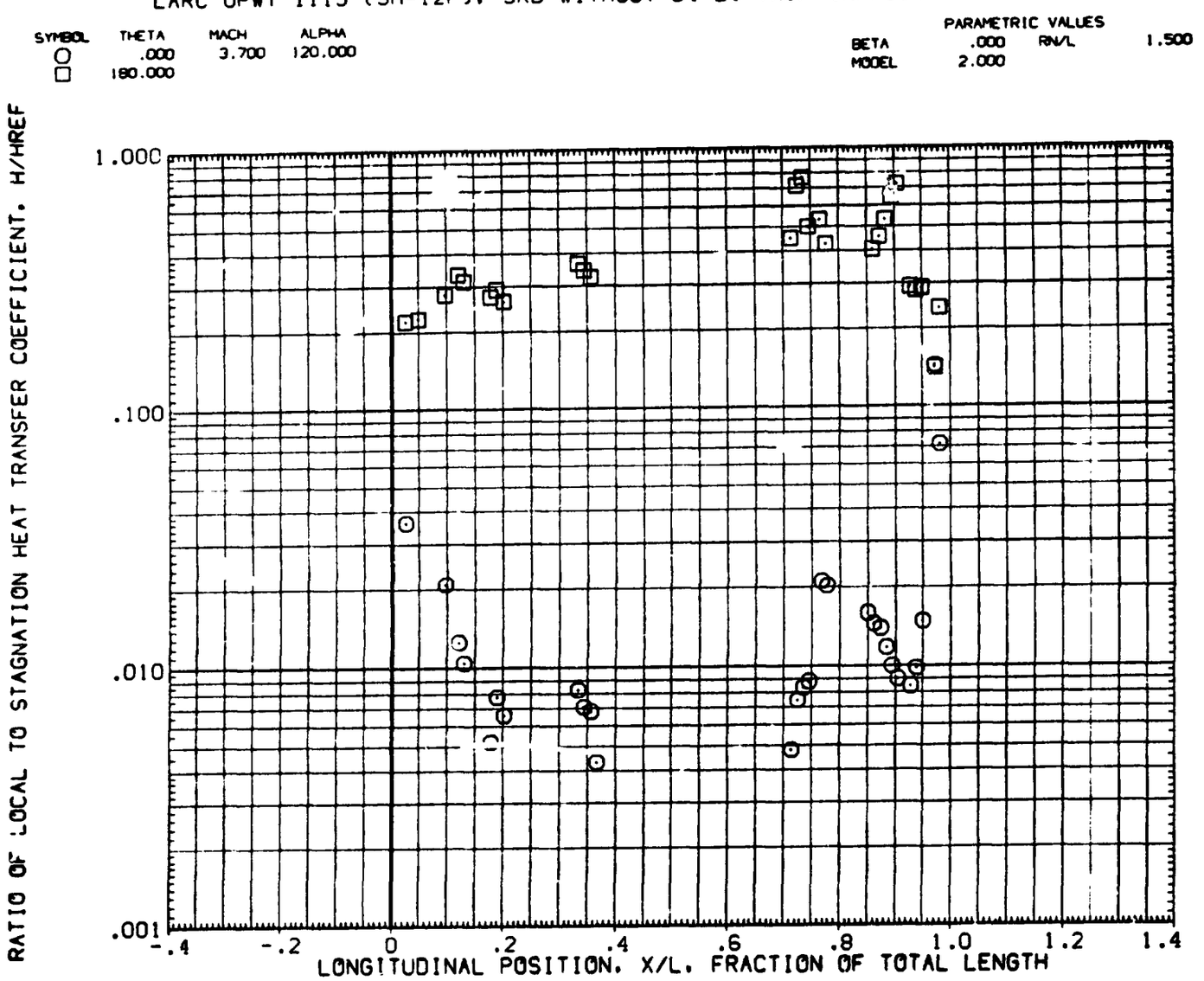


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)

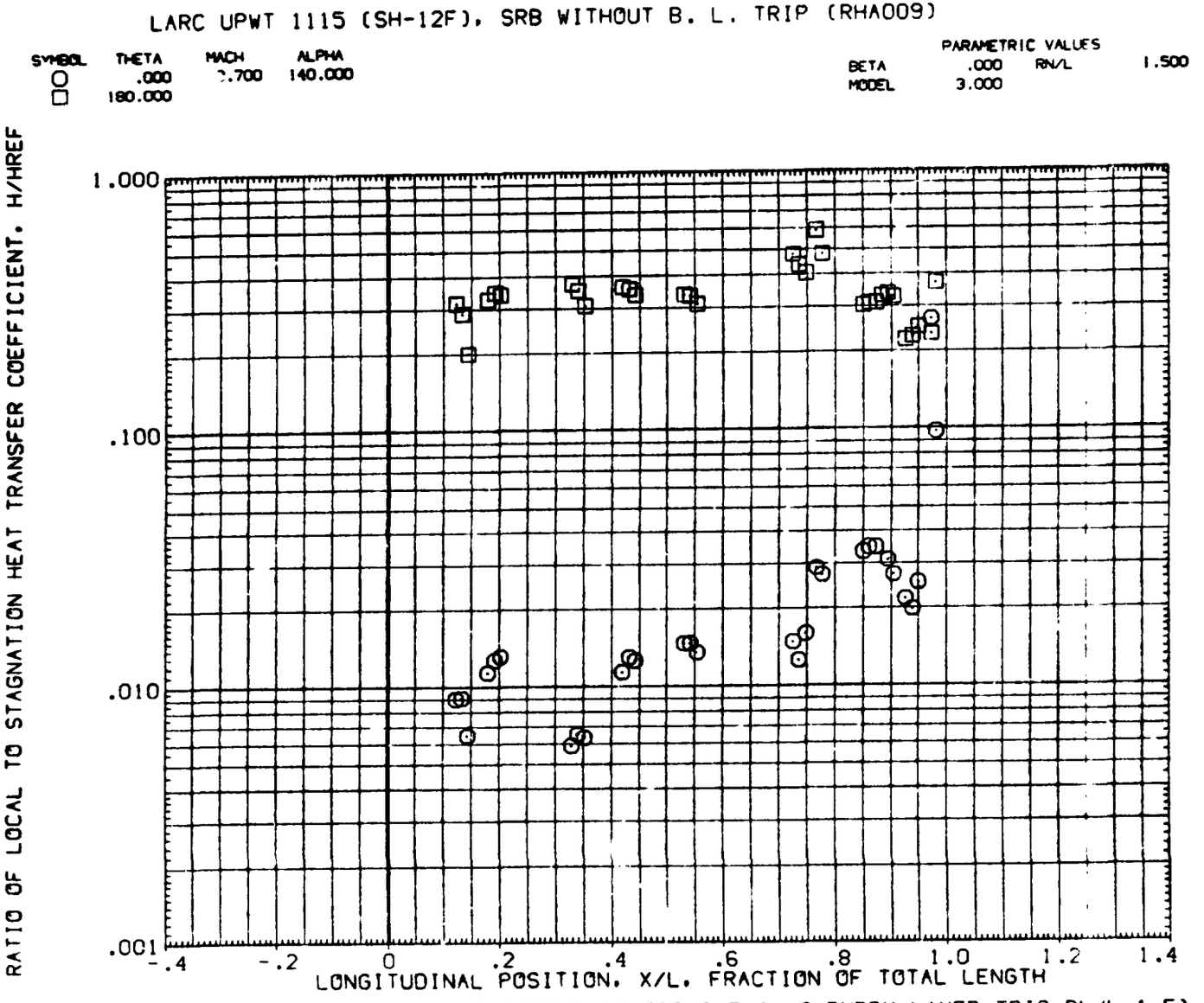
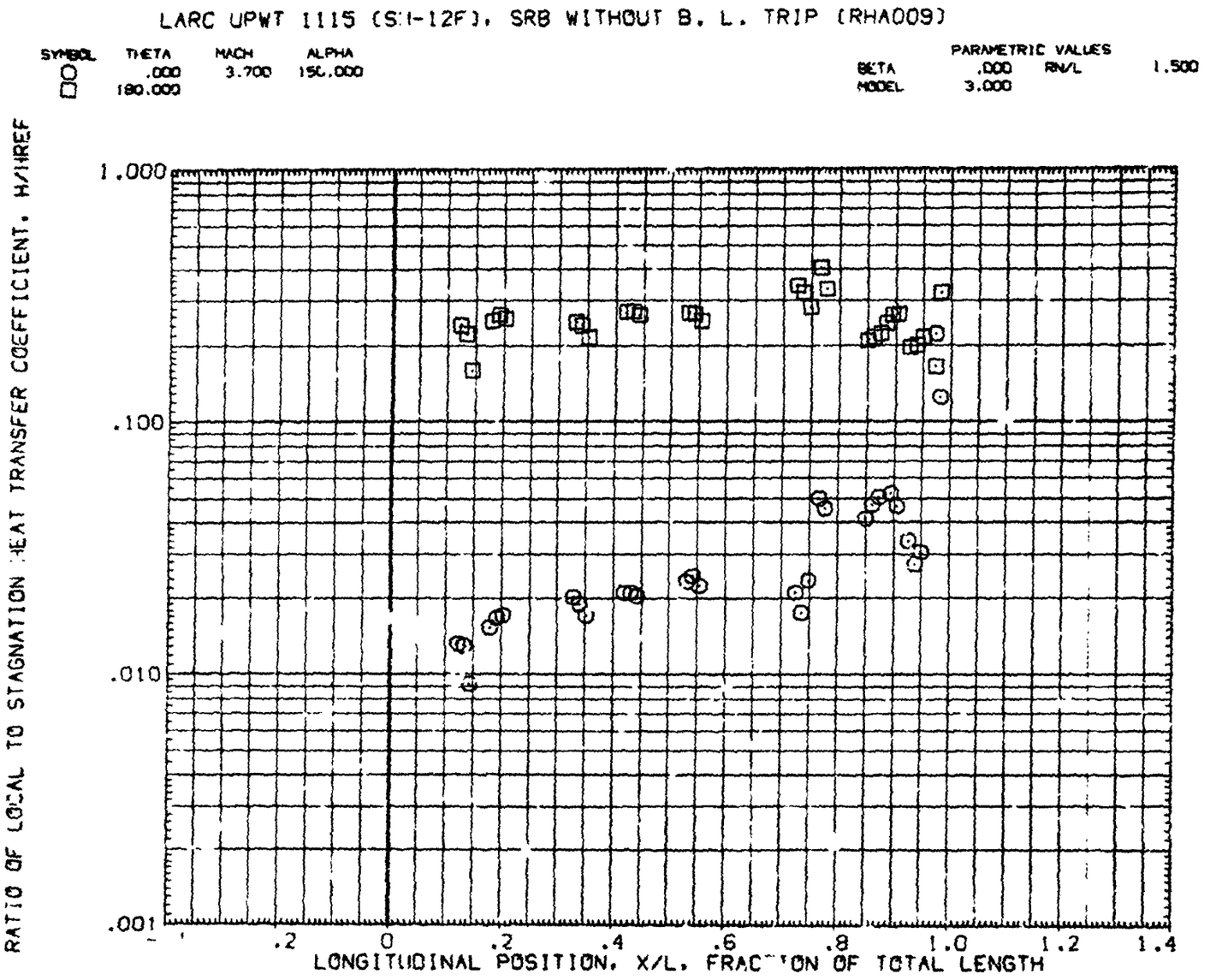


FIGURE 5 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=1.5)



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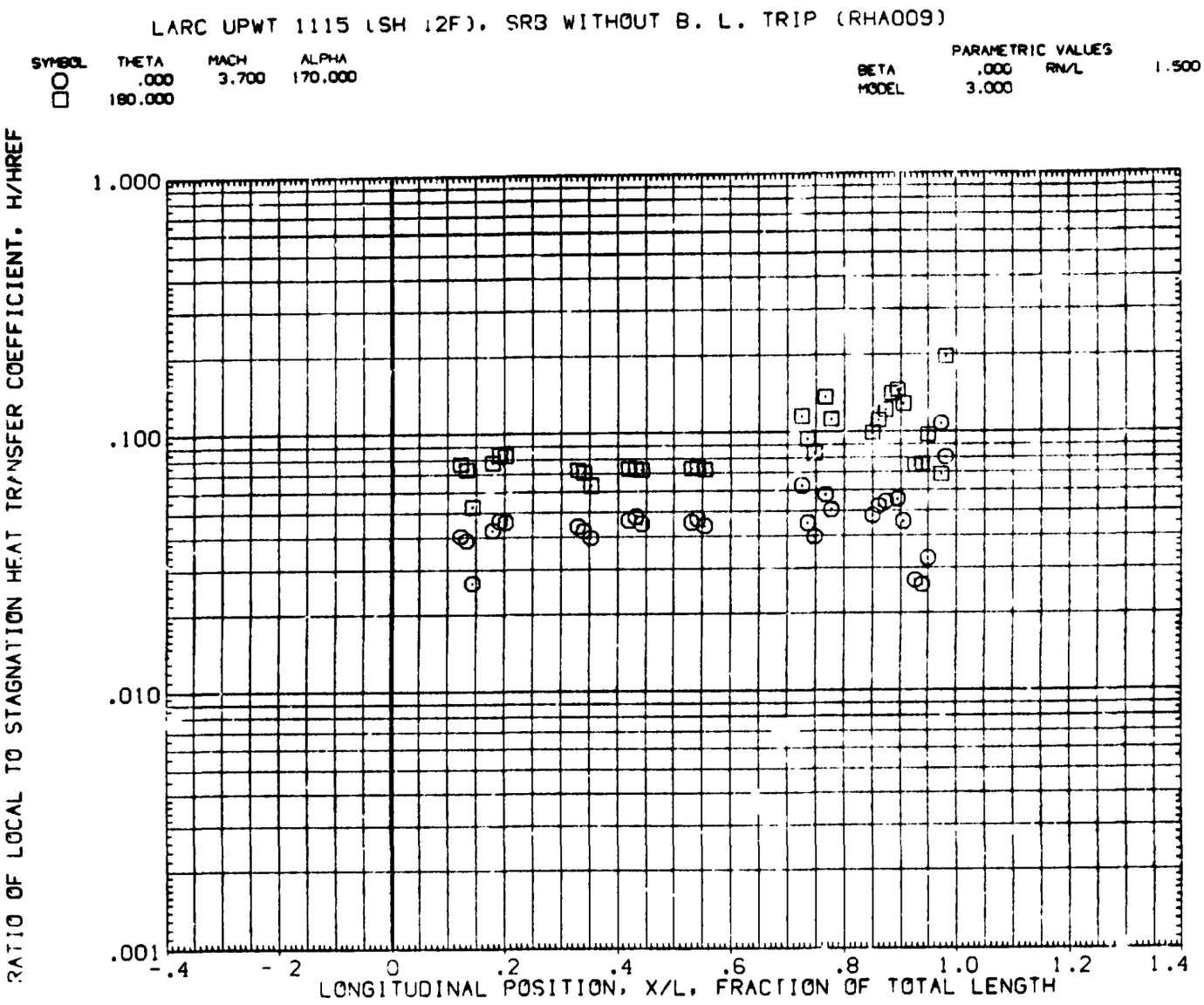

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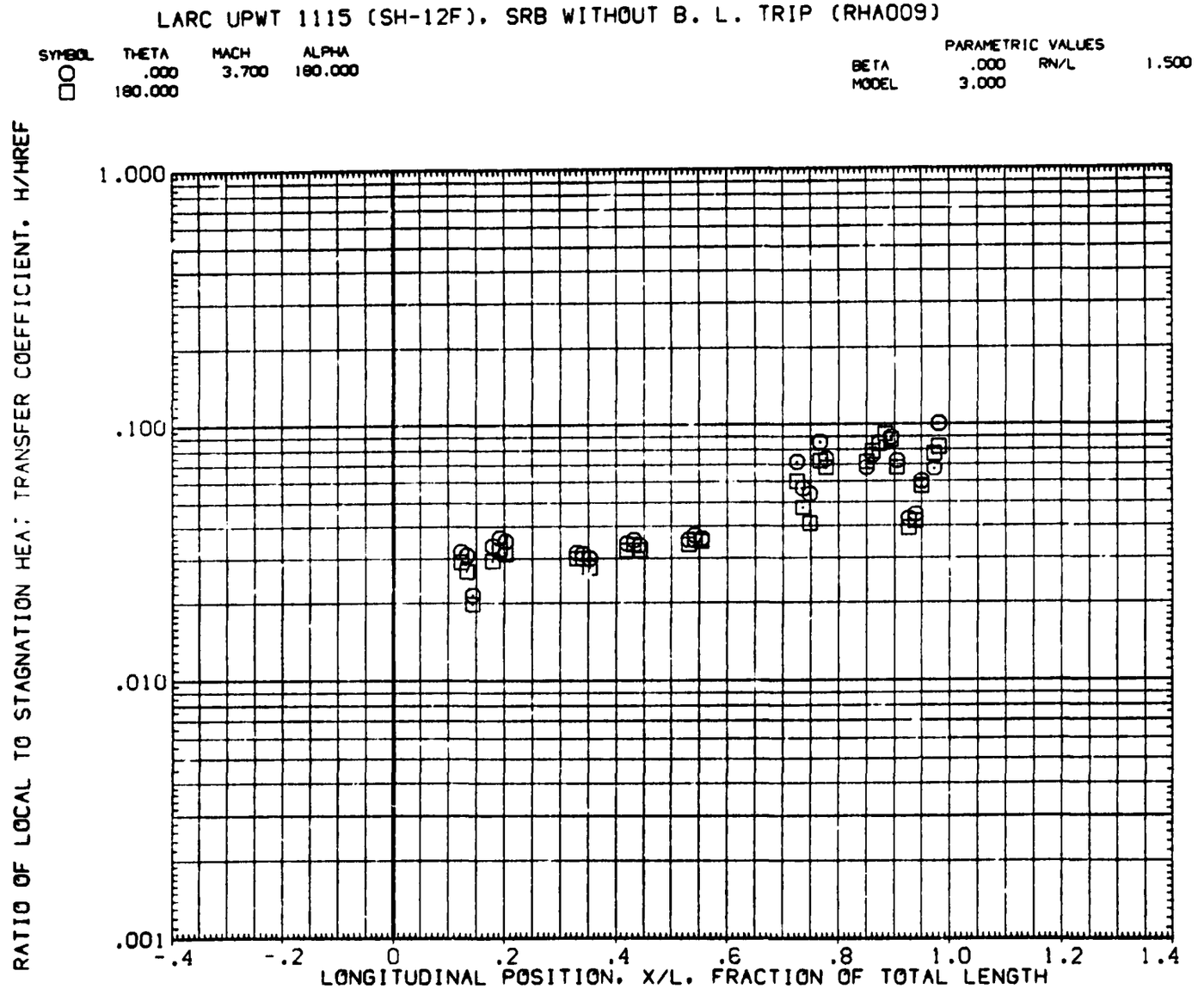

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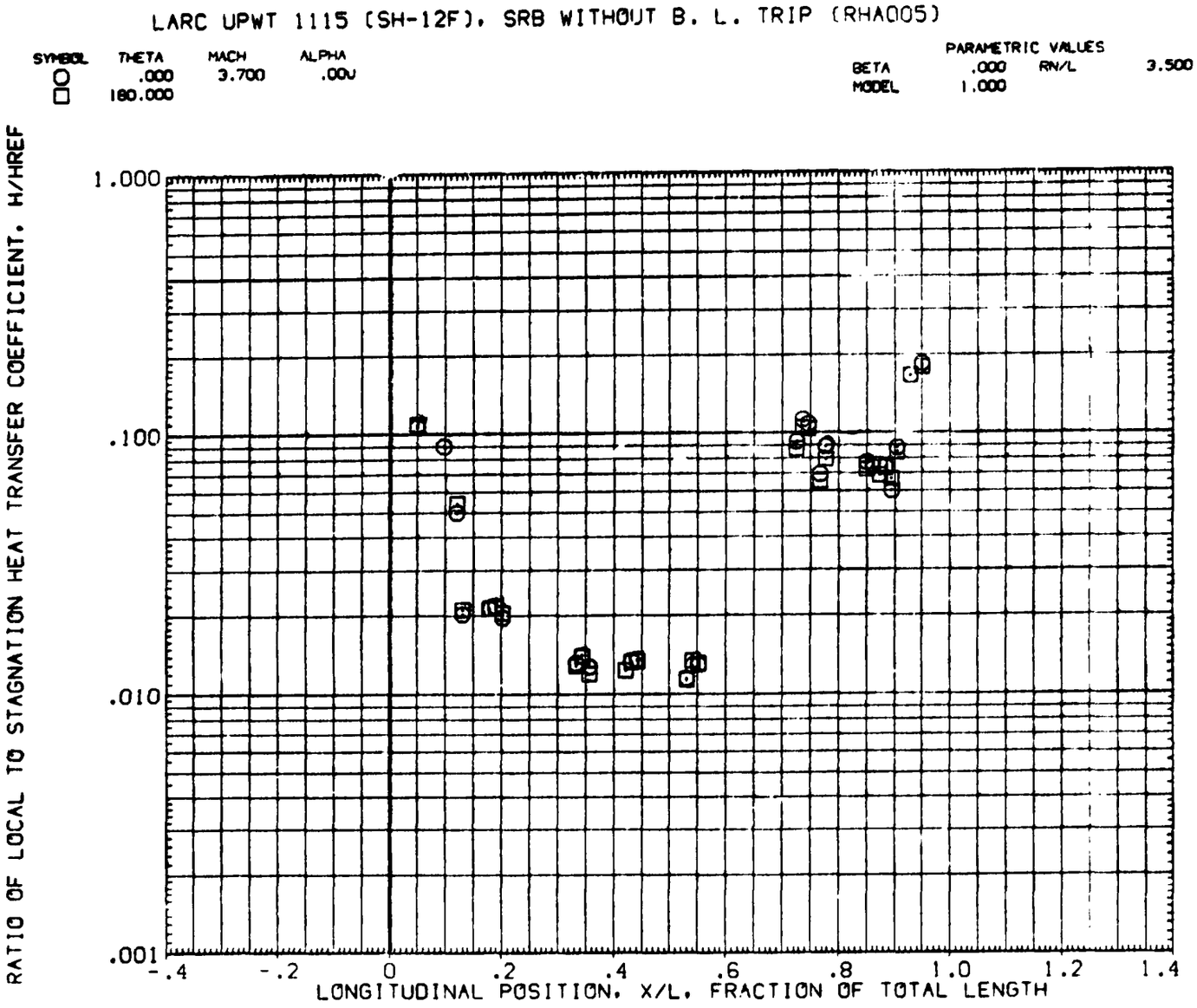


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)

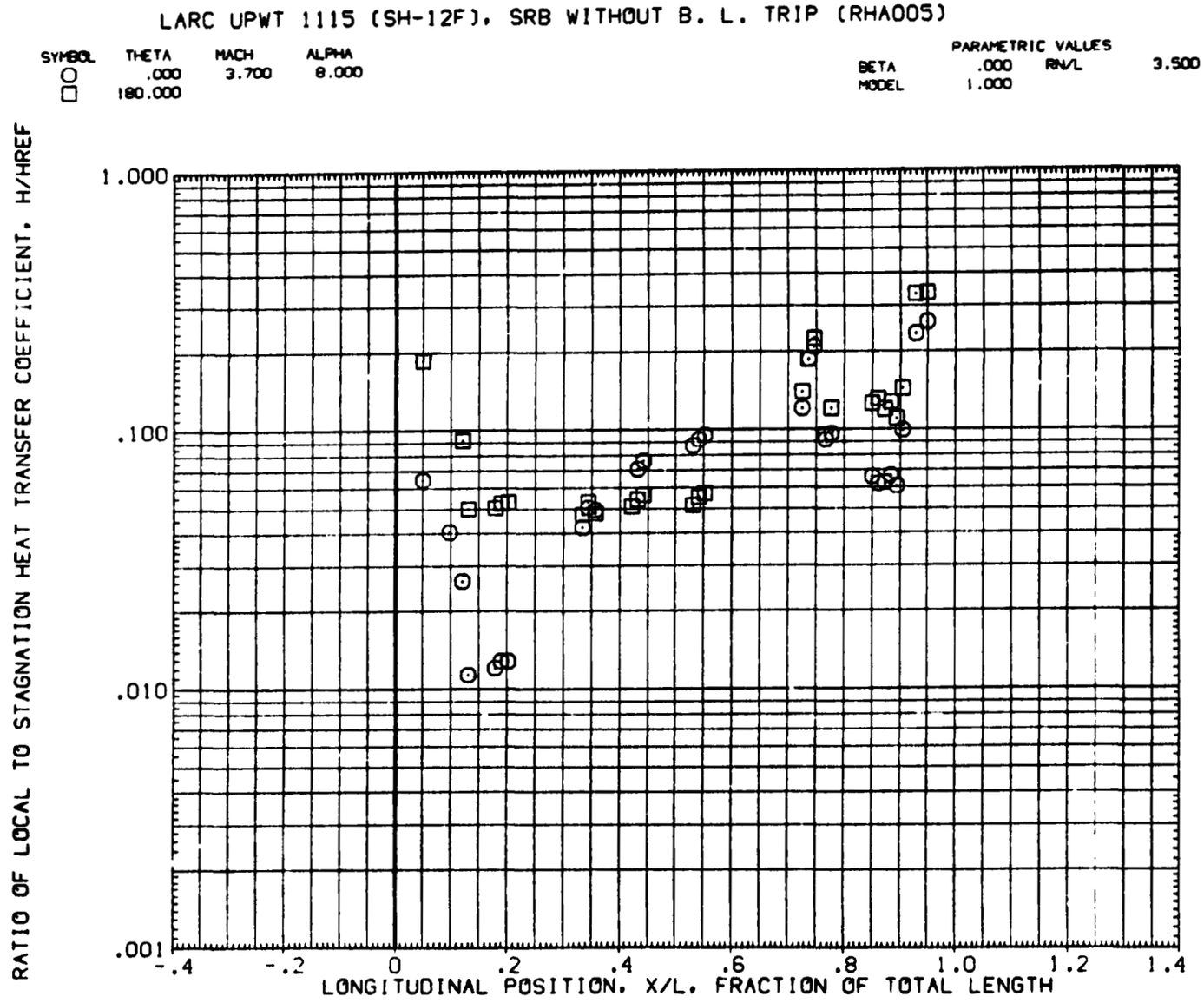
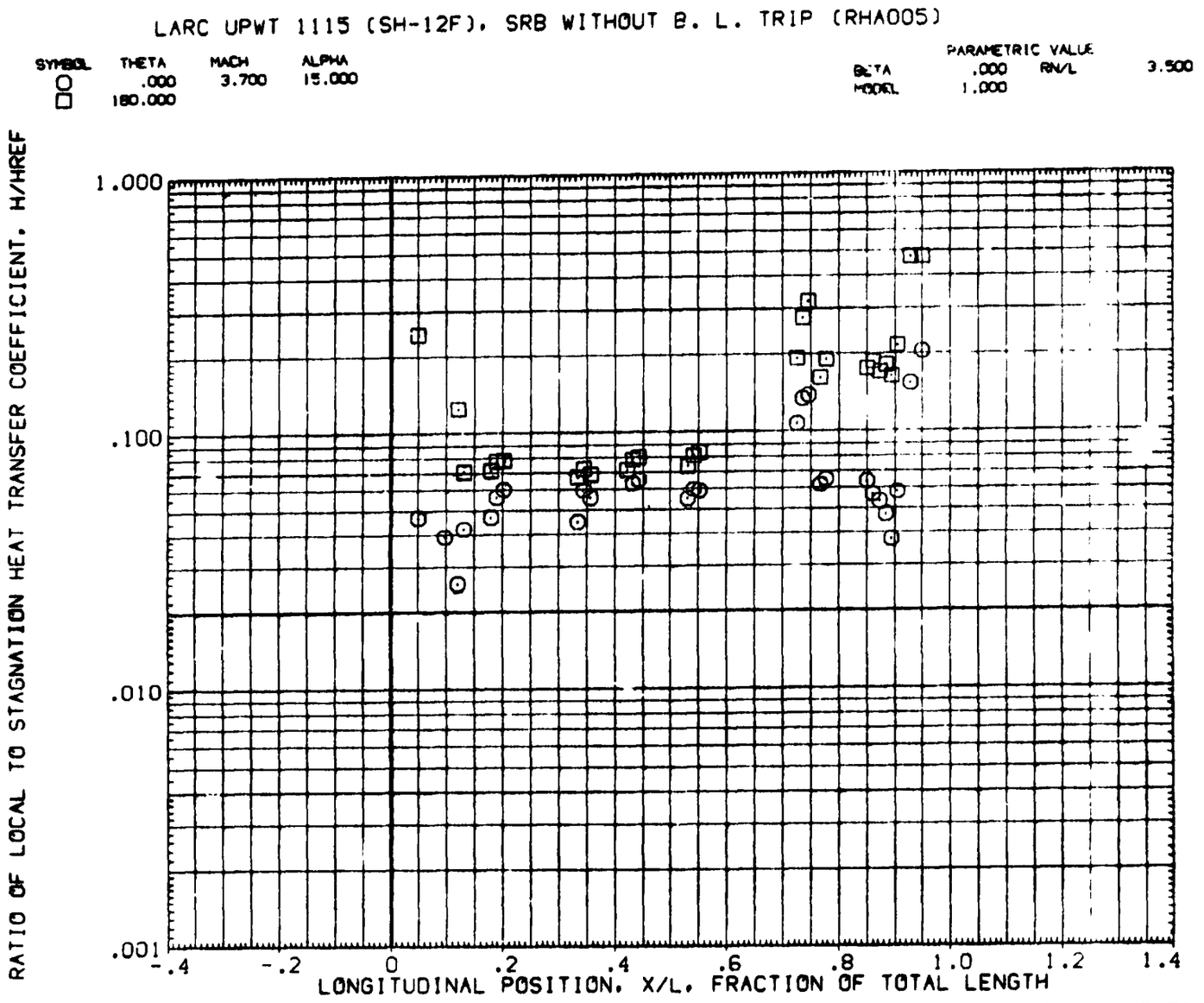


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)



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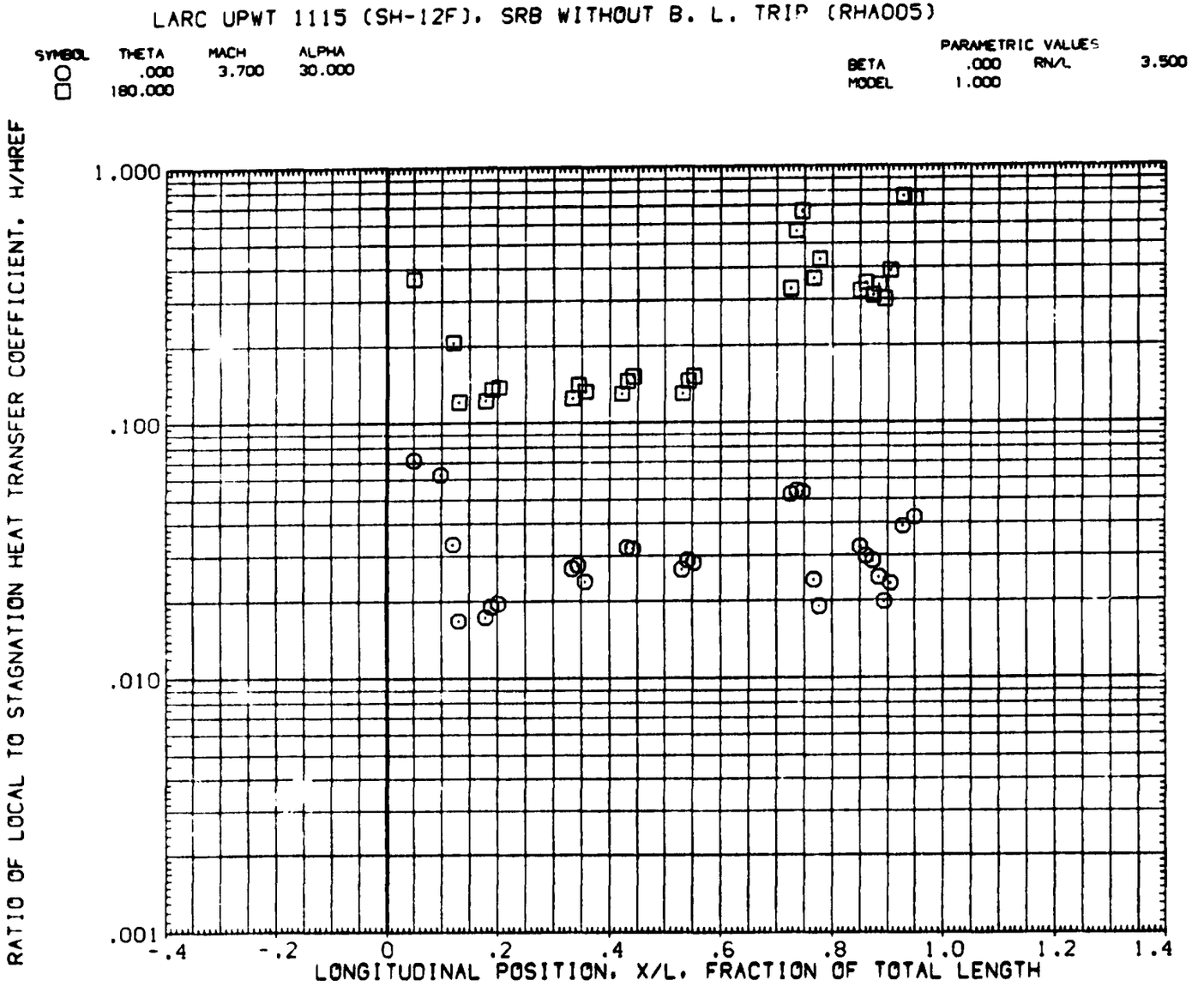

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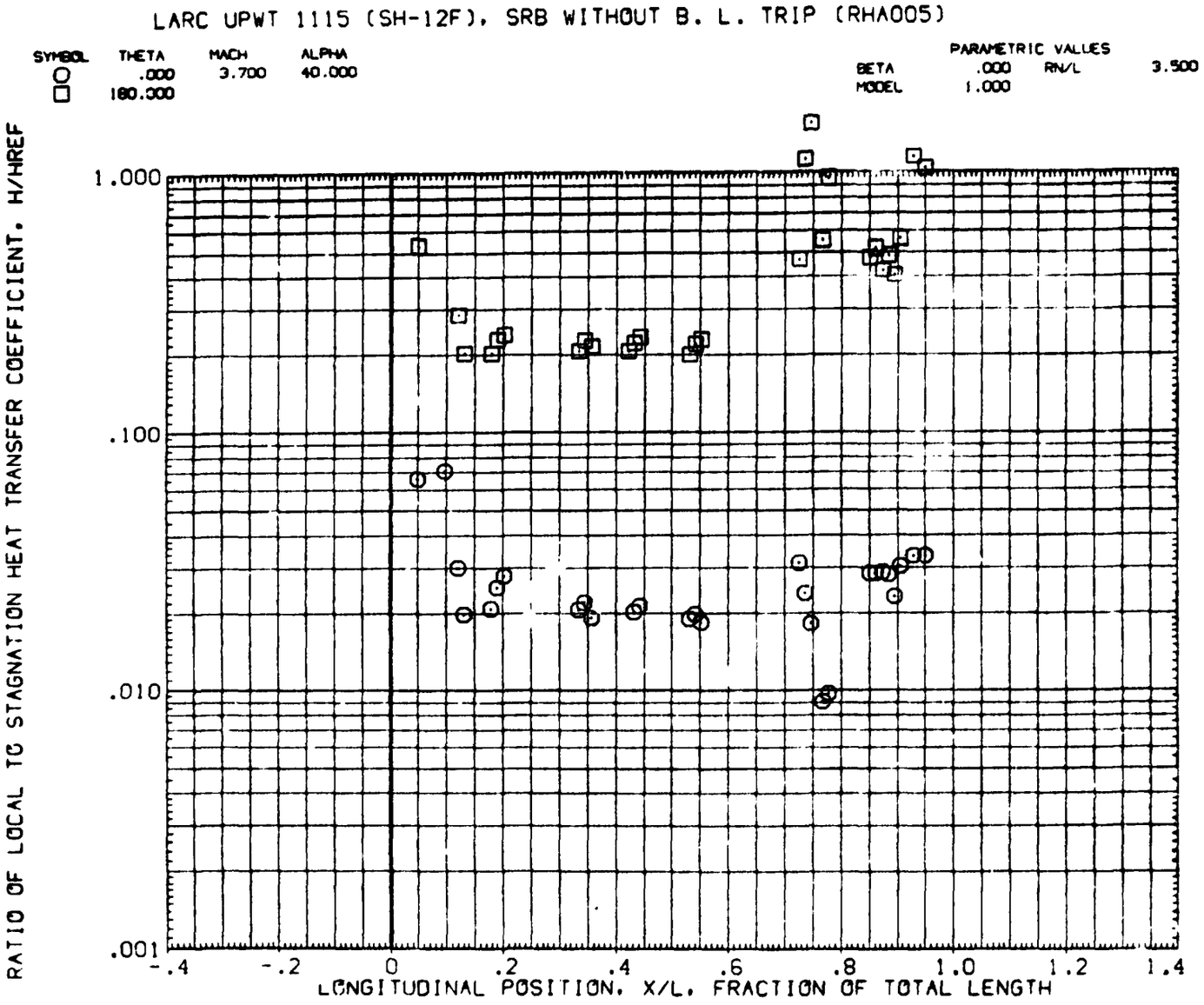
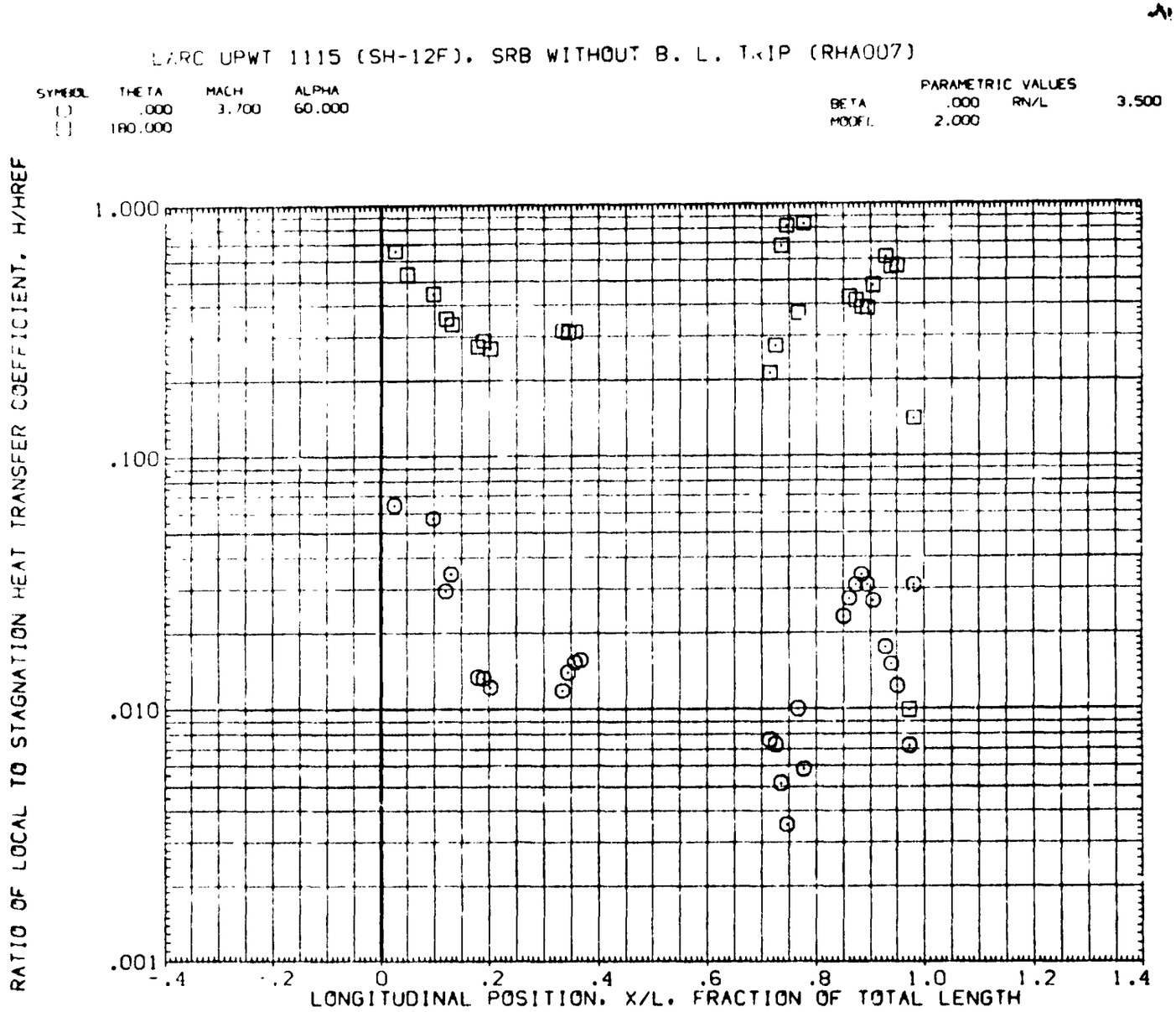


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)



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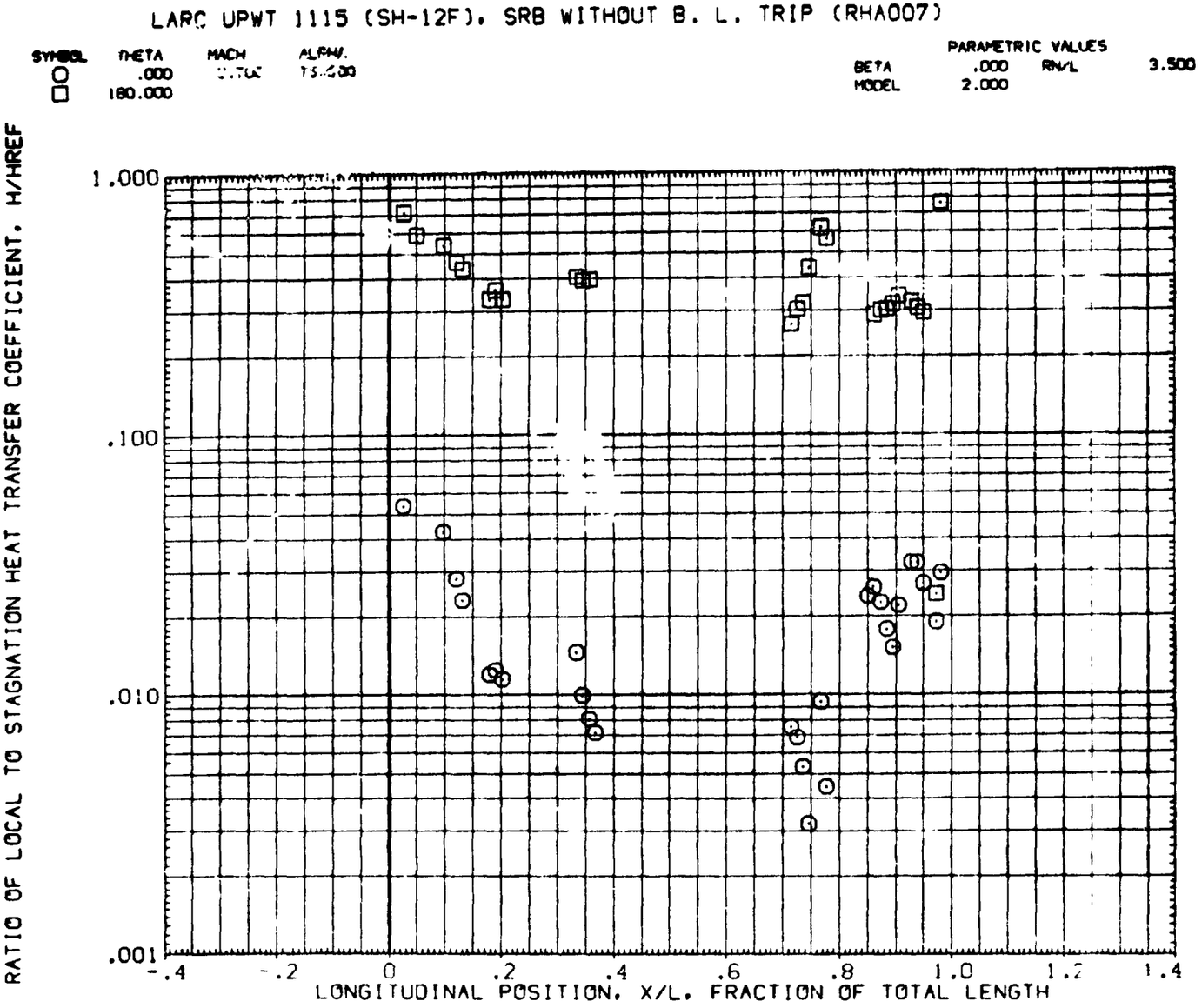

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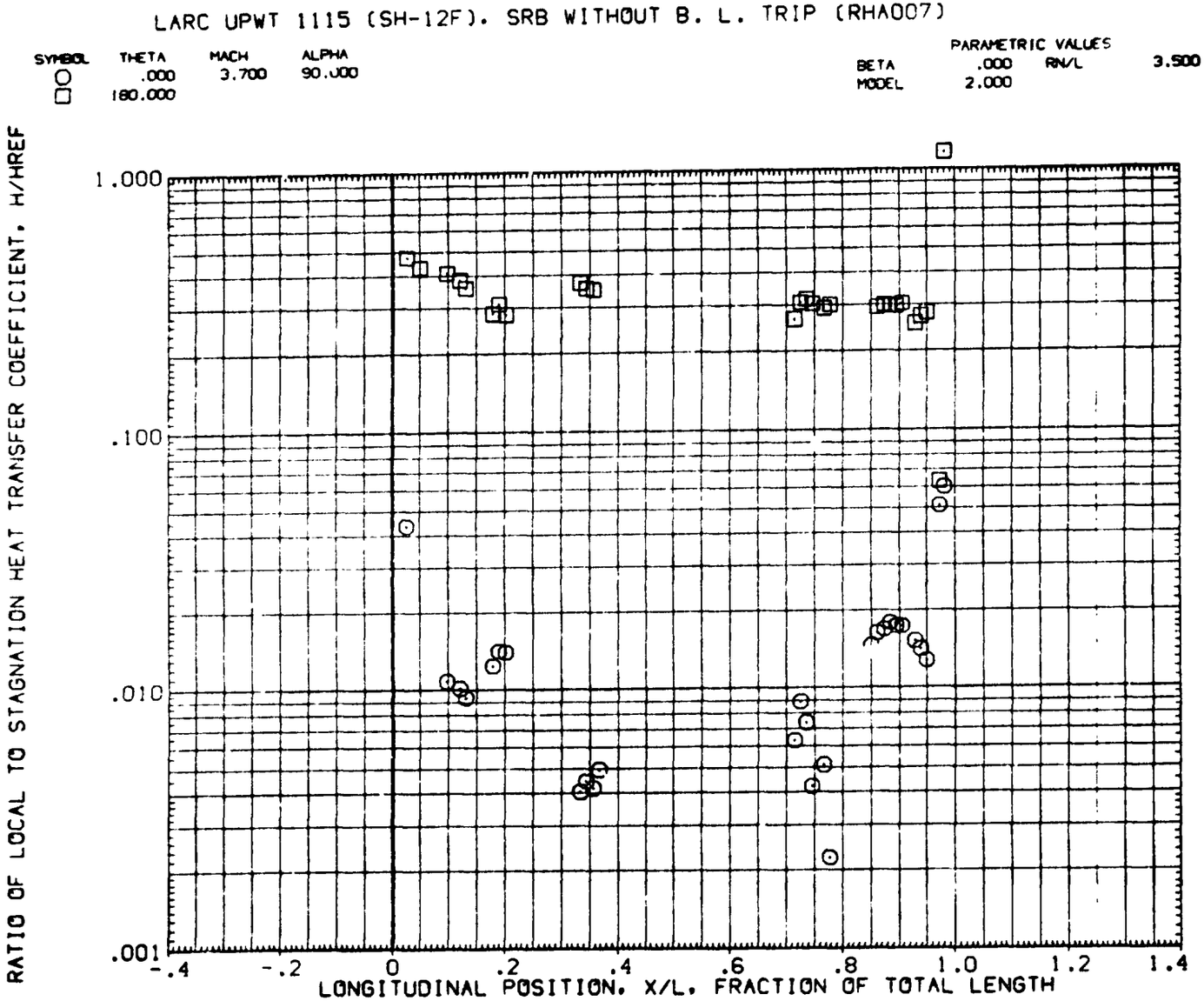

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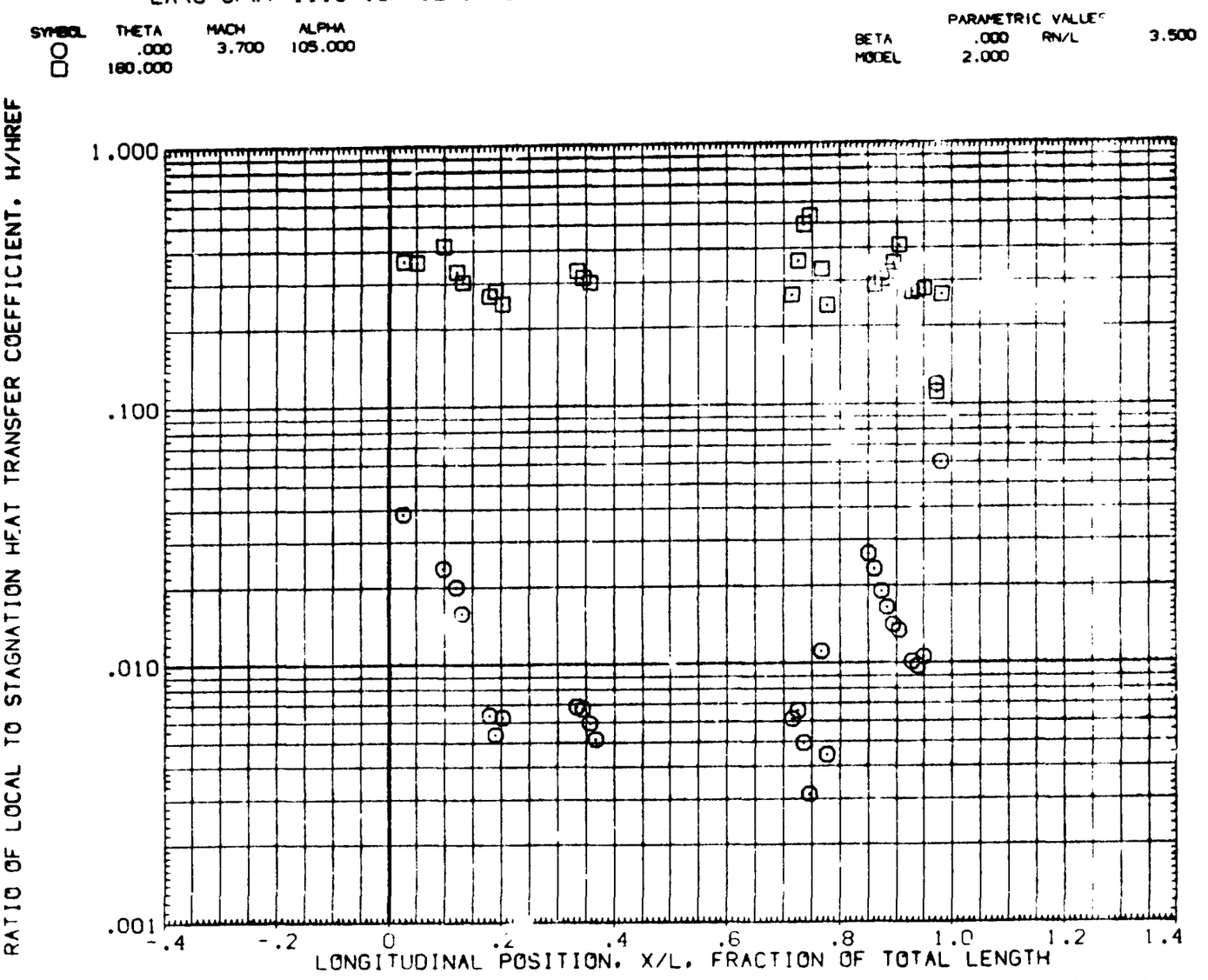

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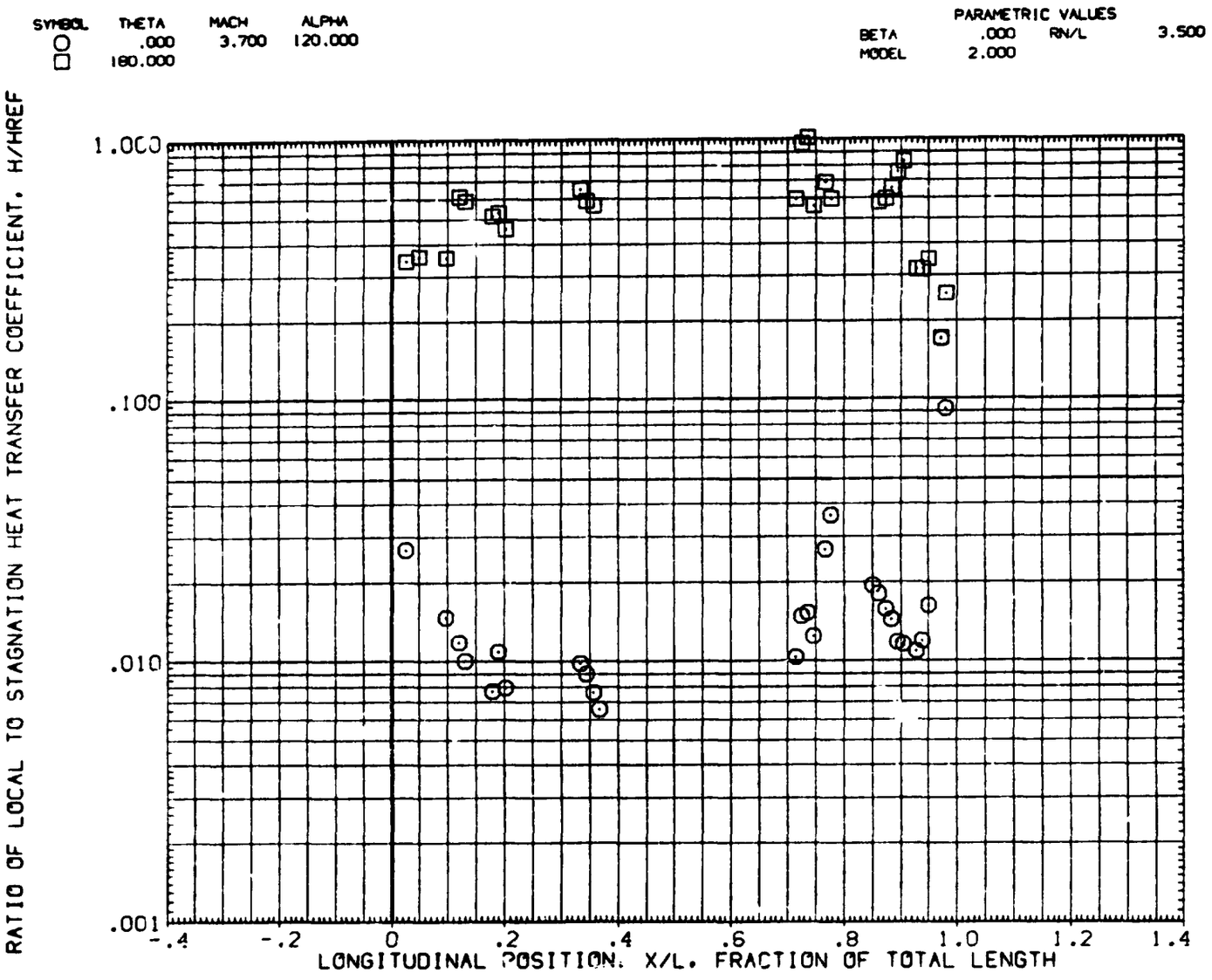
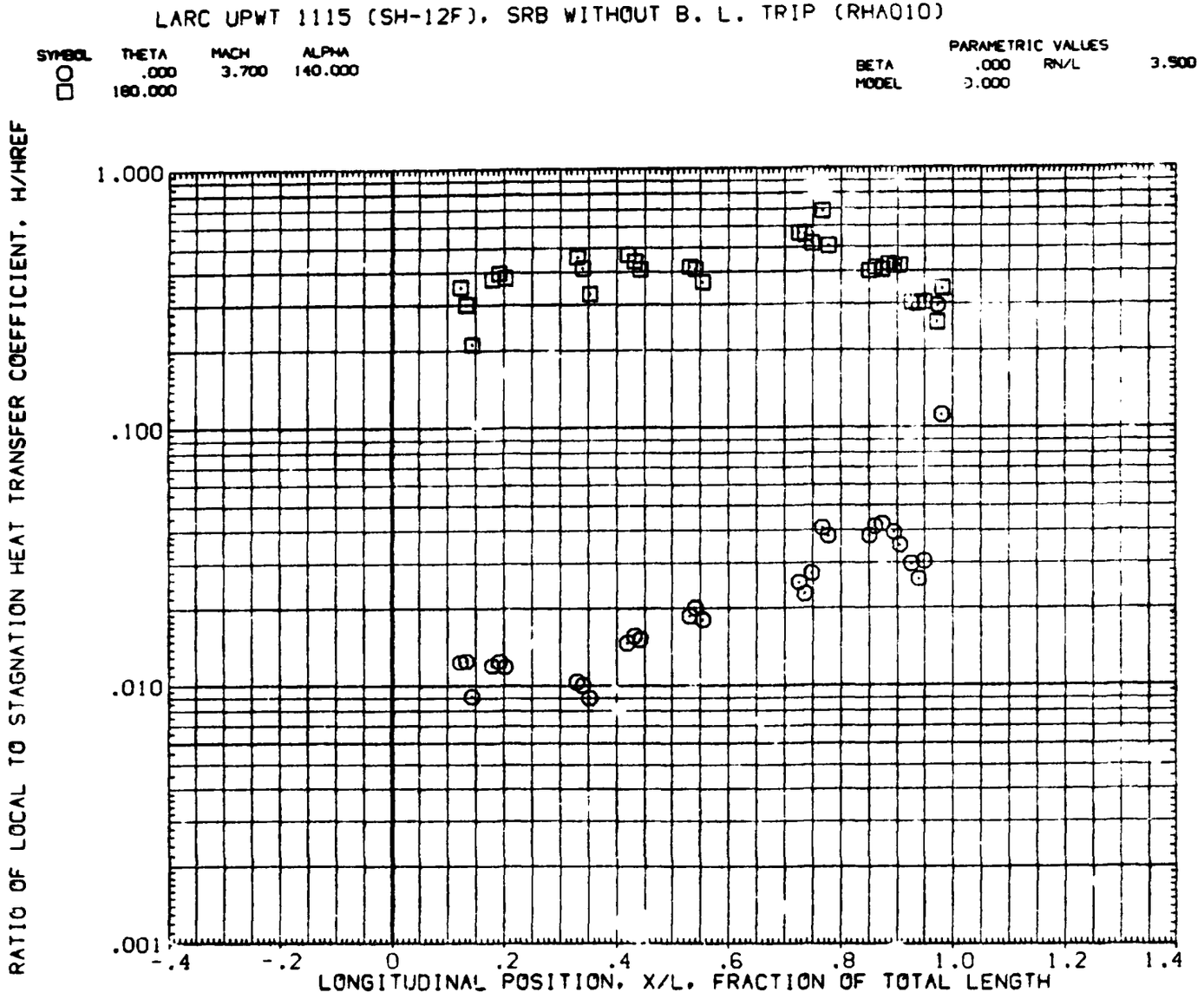


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)



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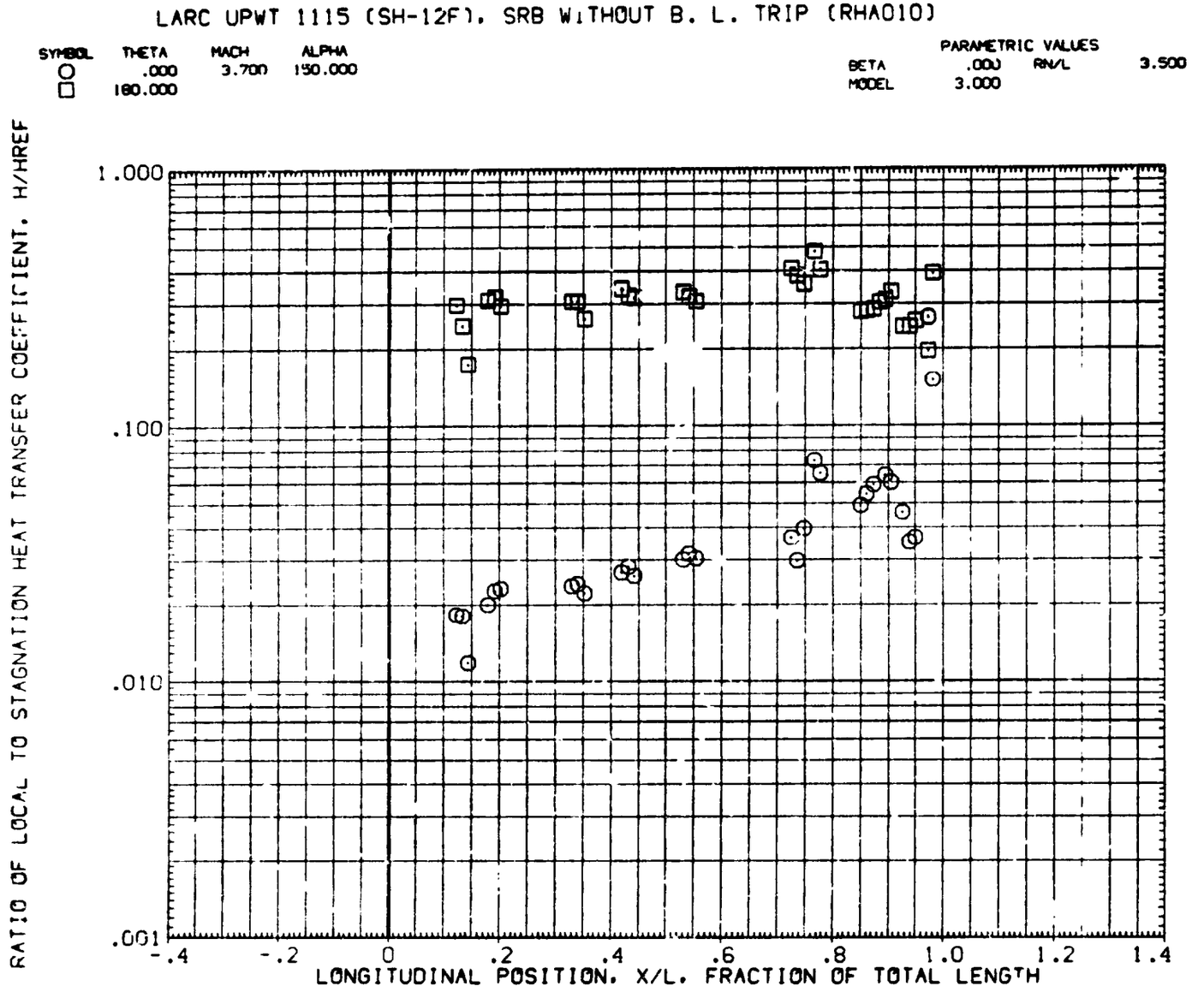

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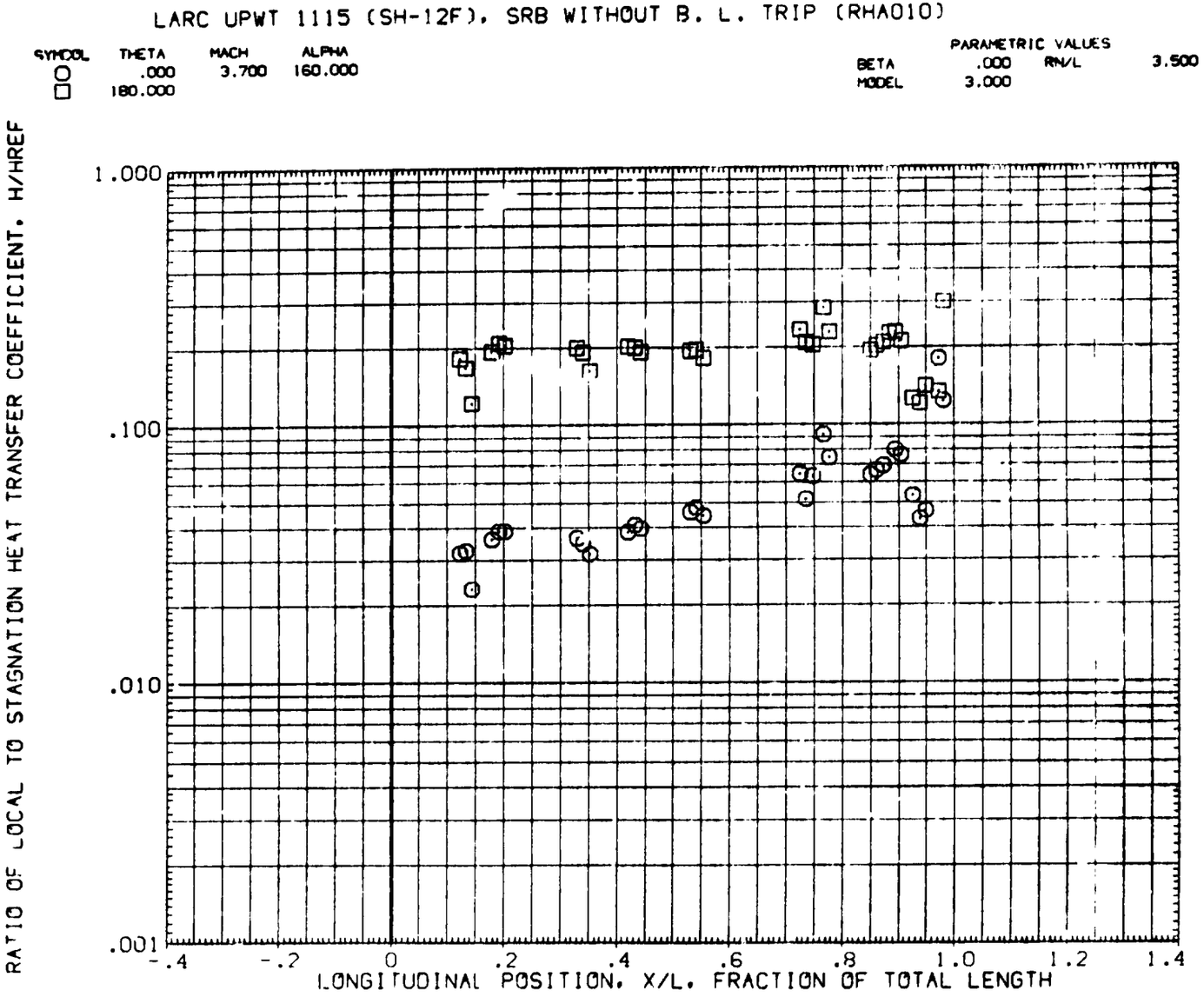

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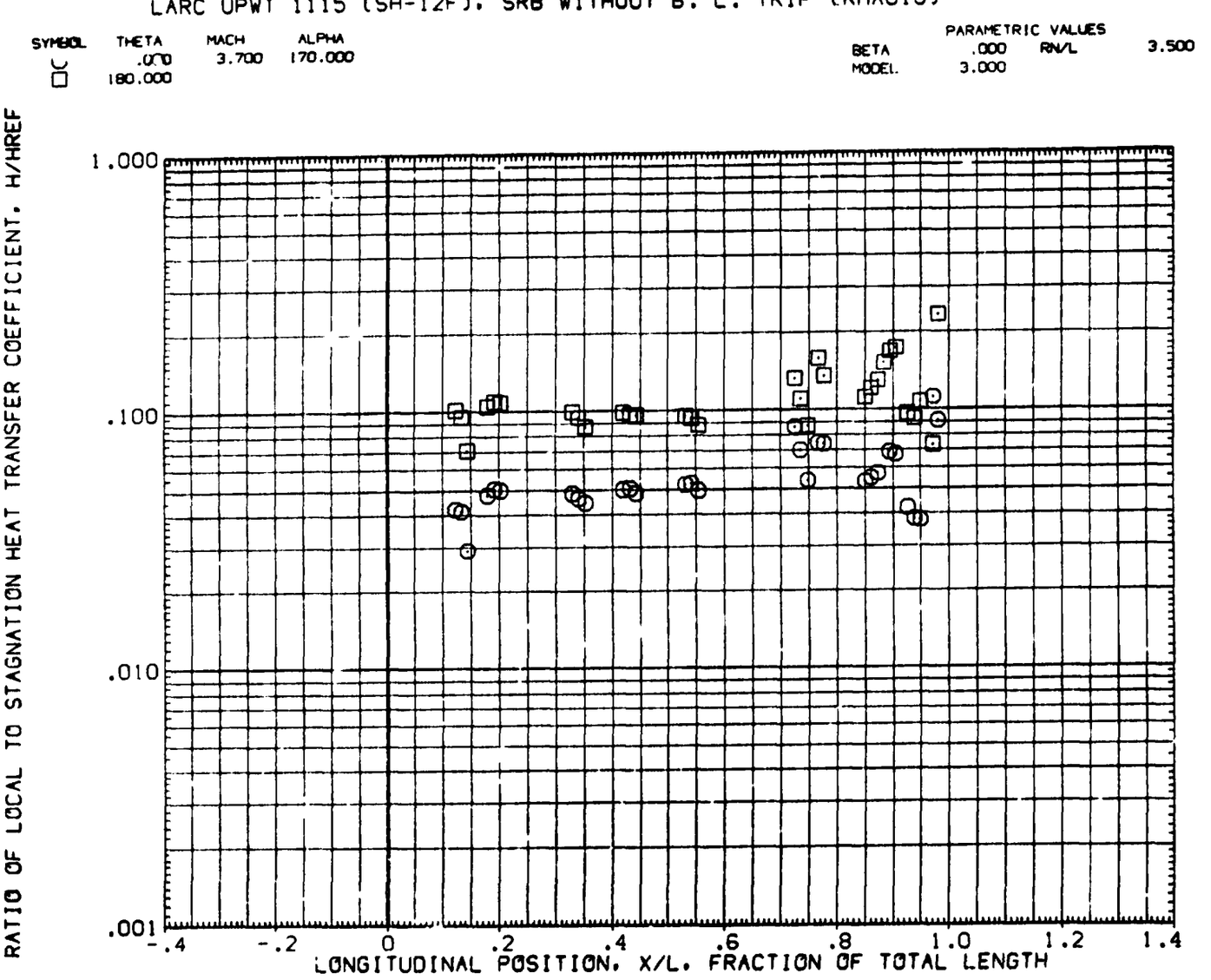


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)

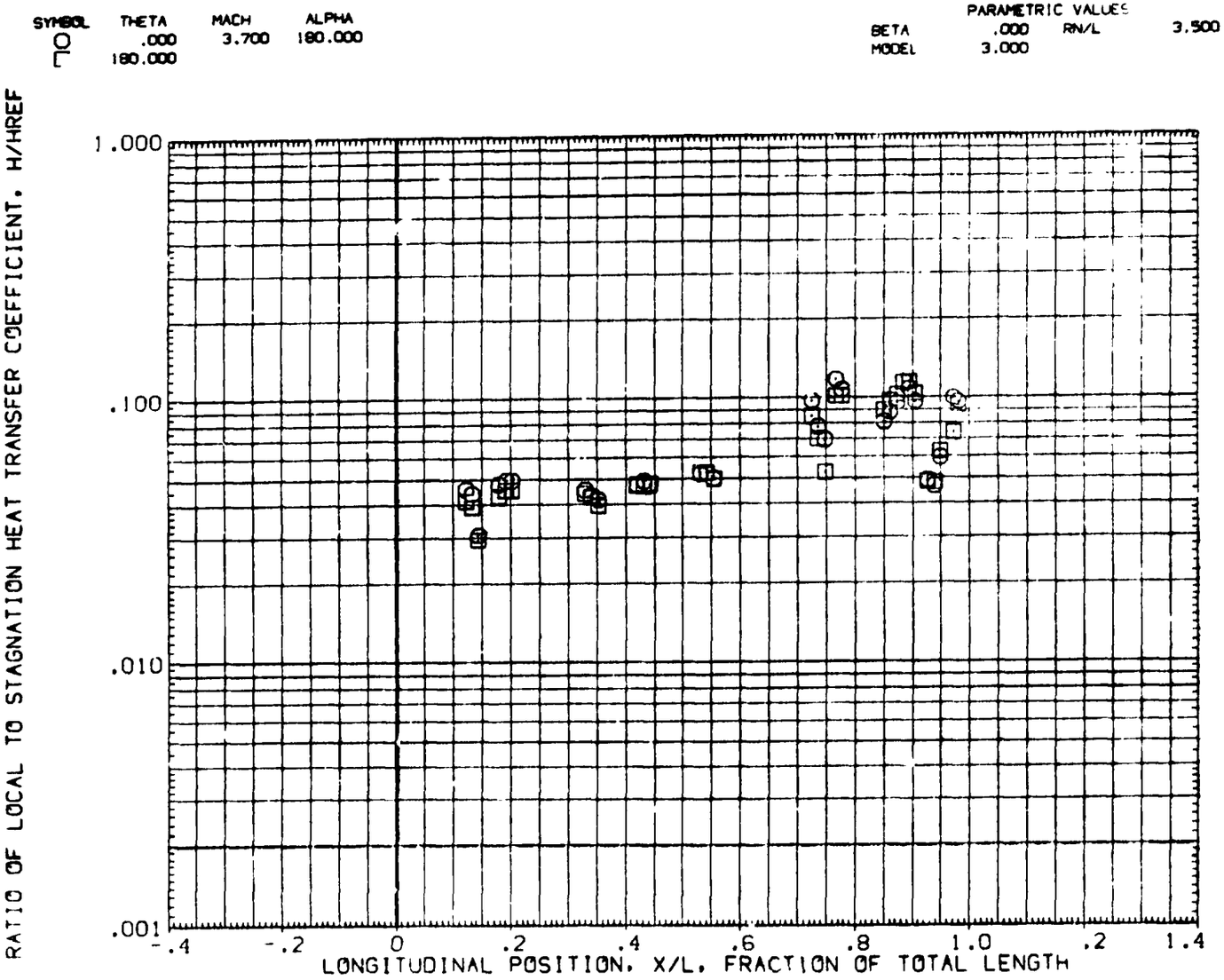


FIGURE 6 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP, RN/L=3.5)

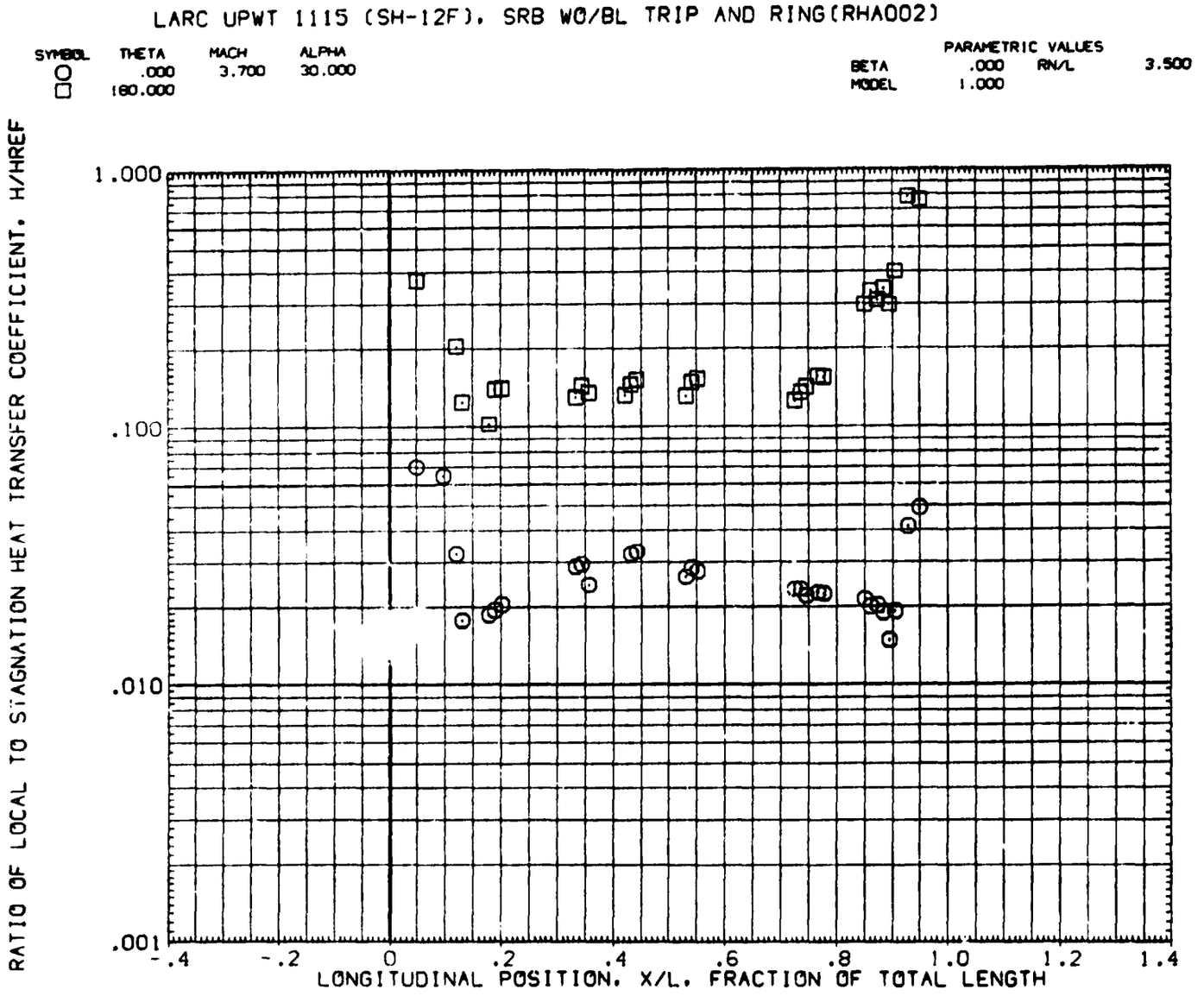


FIGURE 7 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP AND RING)

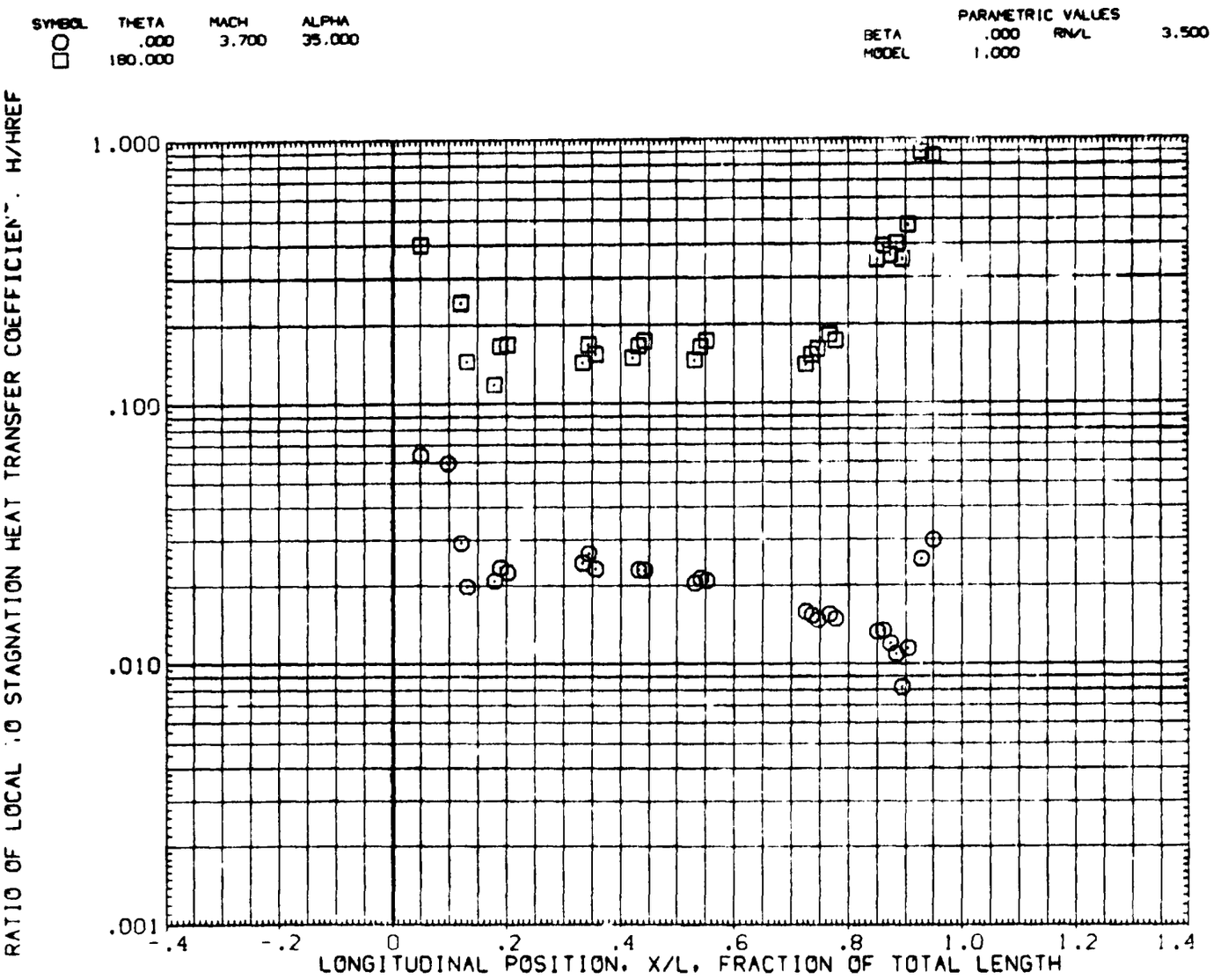
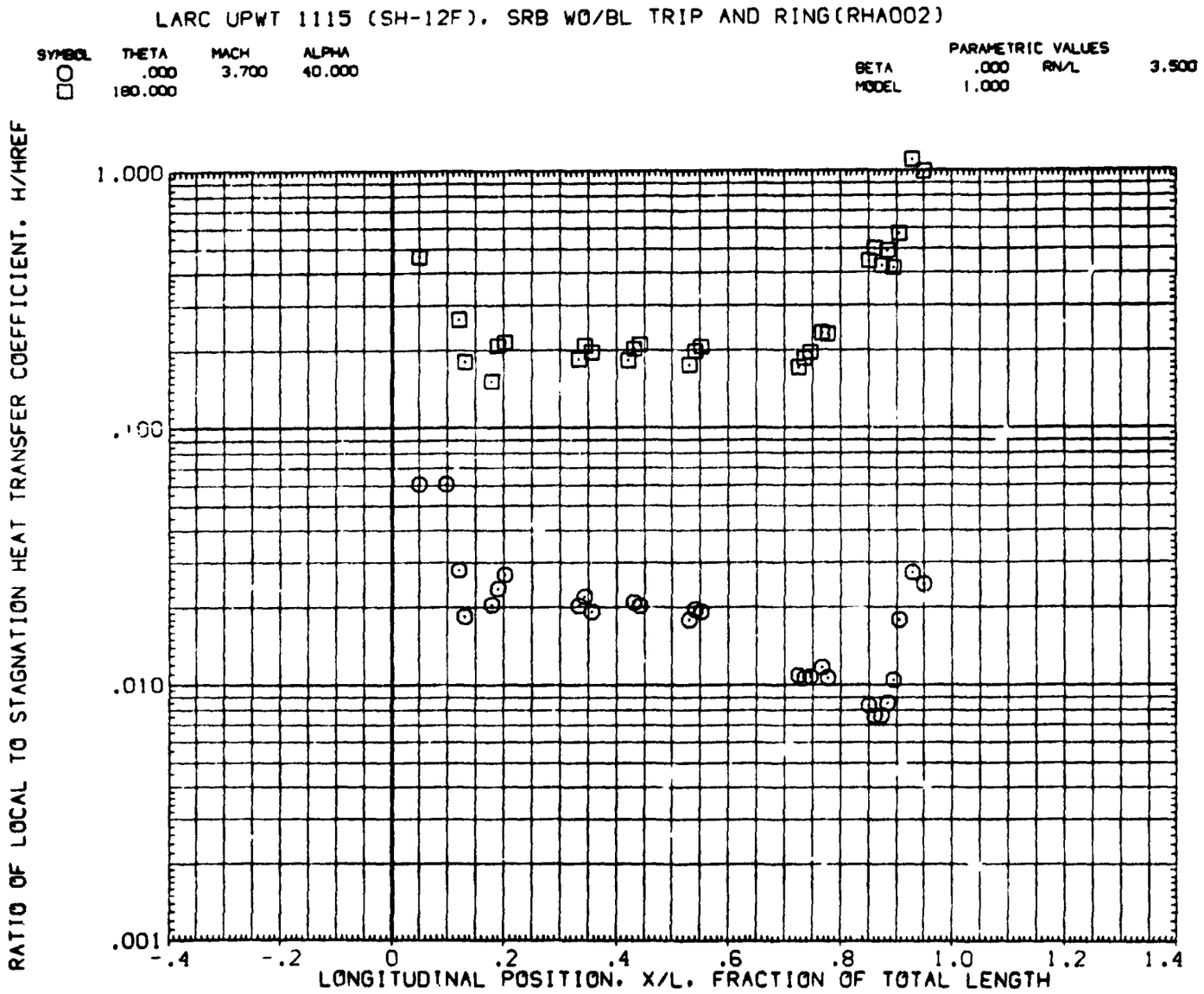


FIGURE 7 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP AND RING)



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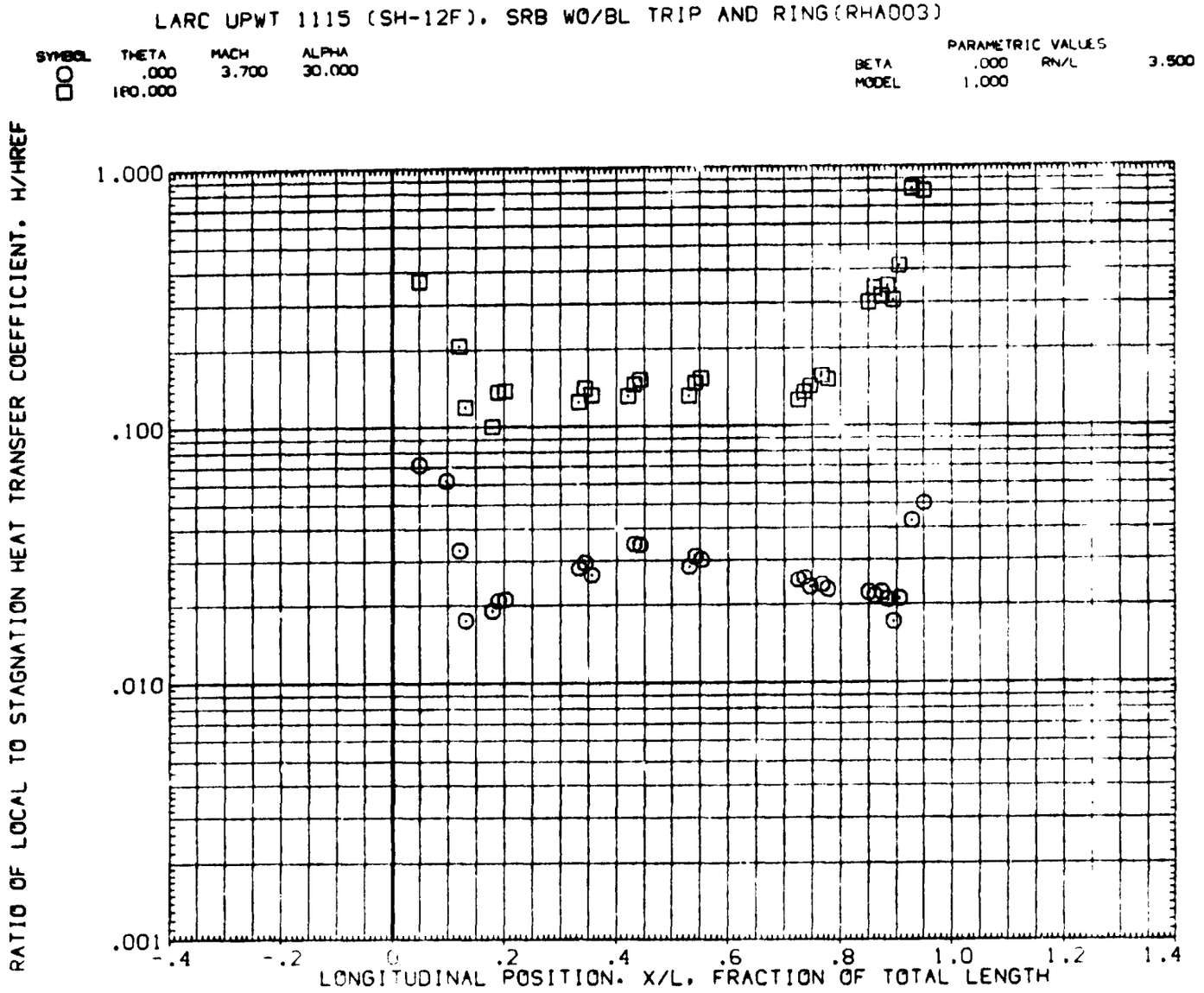


FIGURE 7 H/HREF ALONG TOP AND BOTTOM CENTERLINE (W/O BNDRY LAYER TRIP AND RING)

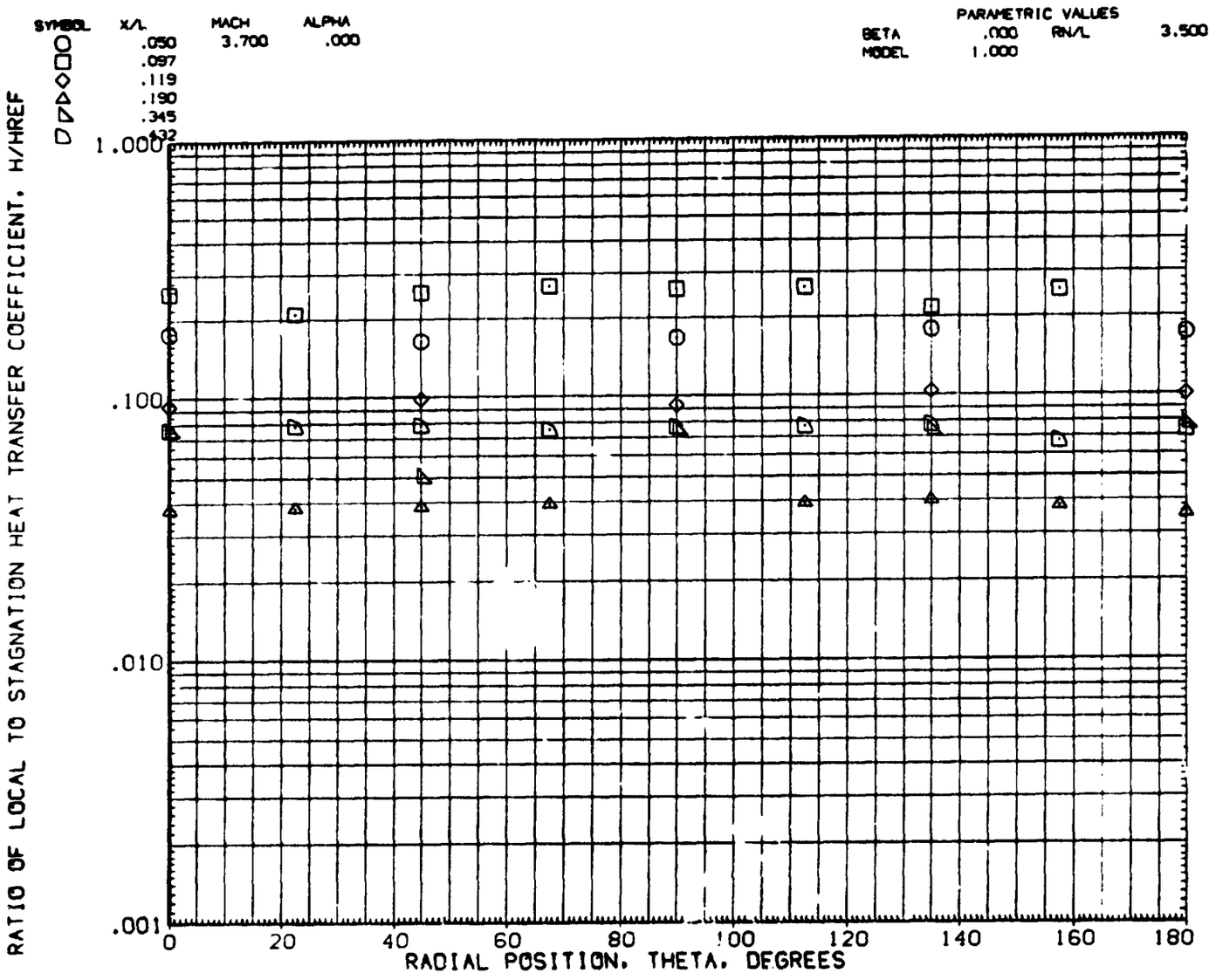


FIGURE 8 H/HREF RADIALLY AT VARIOUS X/L STATIONS(WITH BOUNDRY LAYER TRIP)

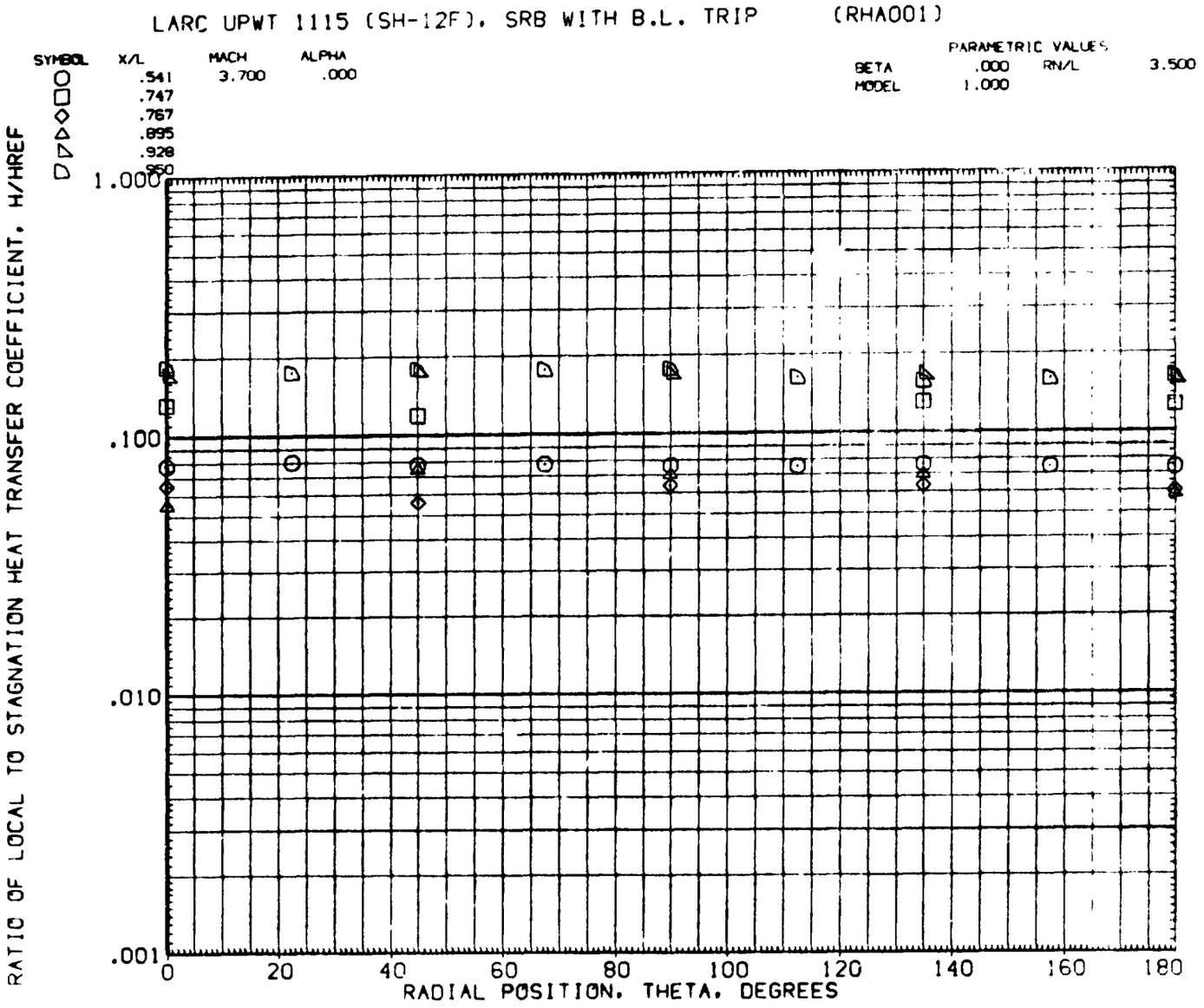


FIGURE 8 H/HREF RADIALLY AT VARIOUS X/L STATIONS(WITH BOUNDRY LAYER TRIP

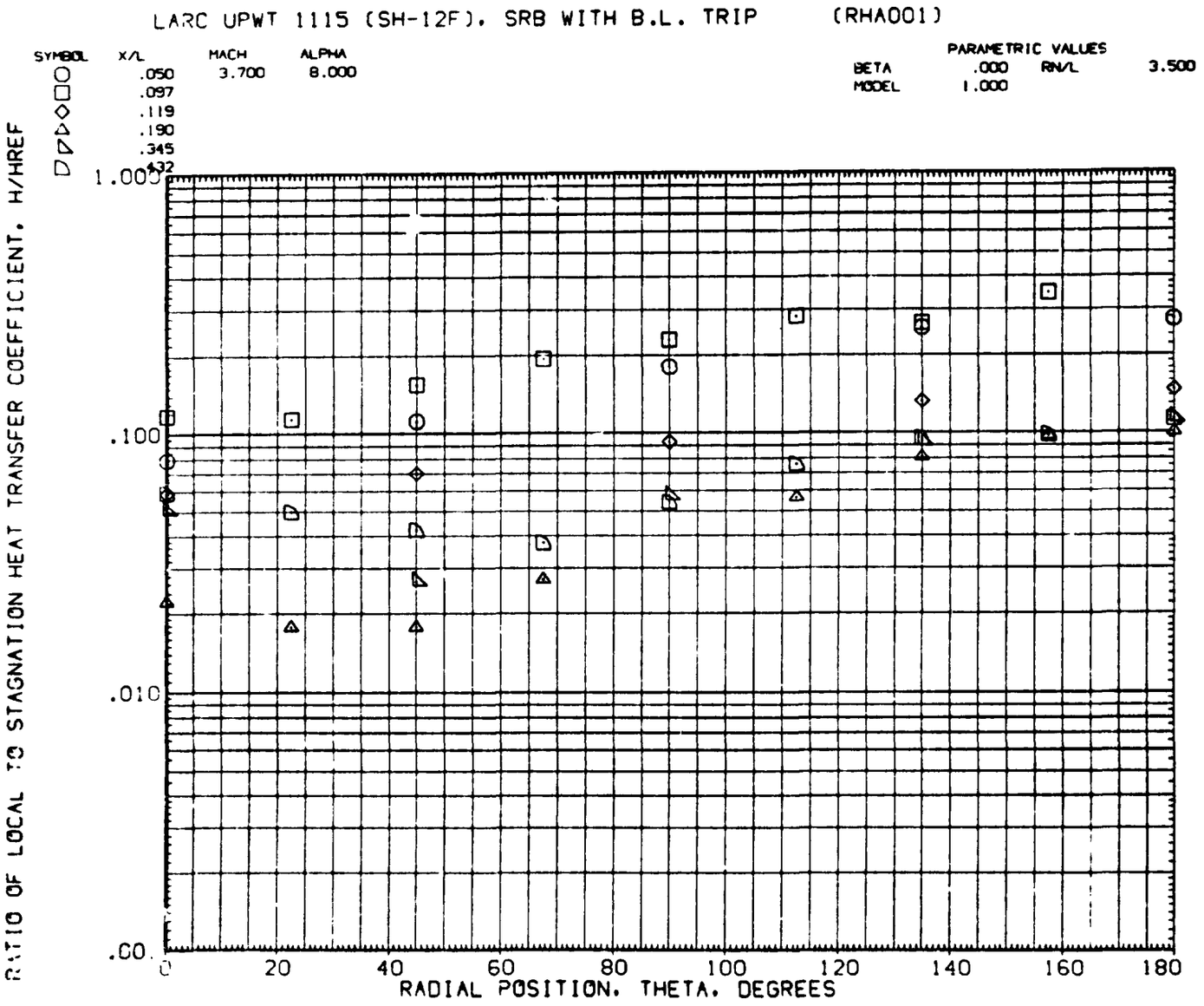
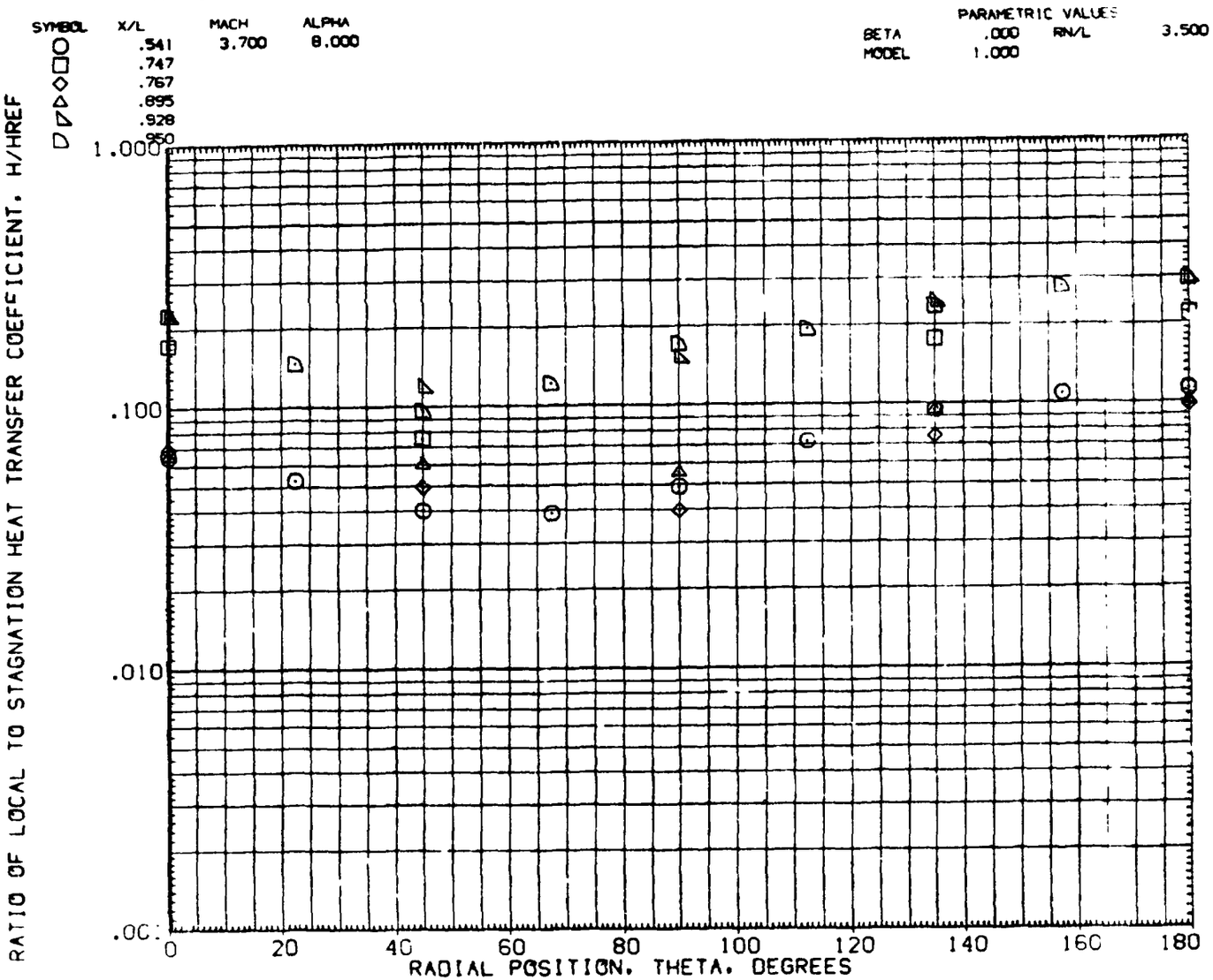


FIGURE 8 H/HREF RADIALLY AT VARIOUS X/L STATIONS(WITH BOUNDRY LAYER TRIP)



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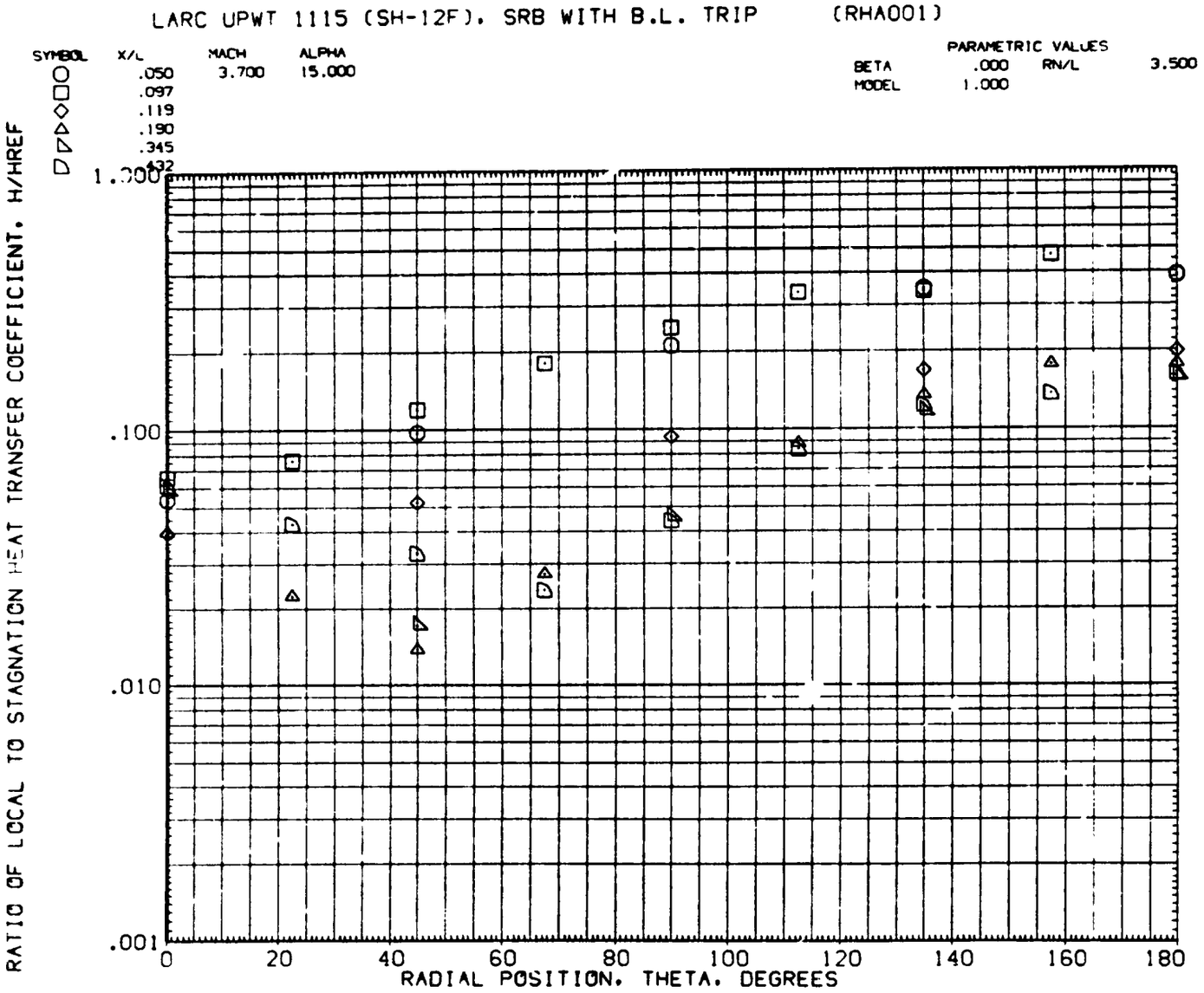

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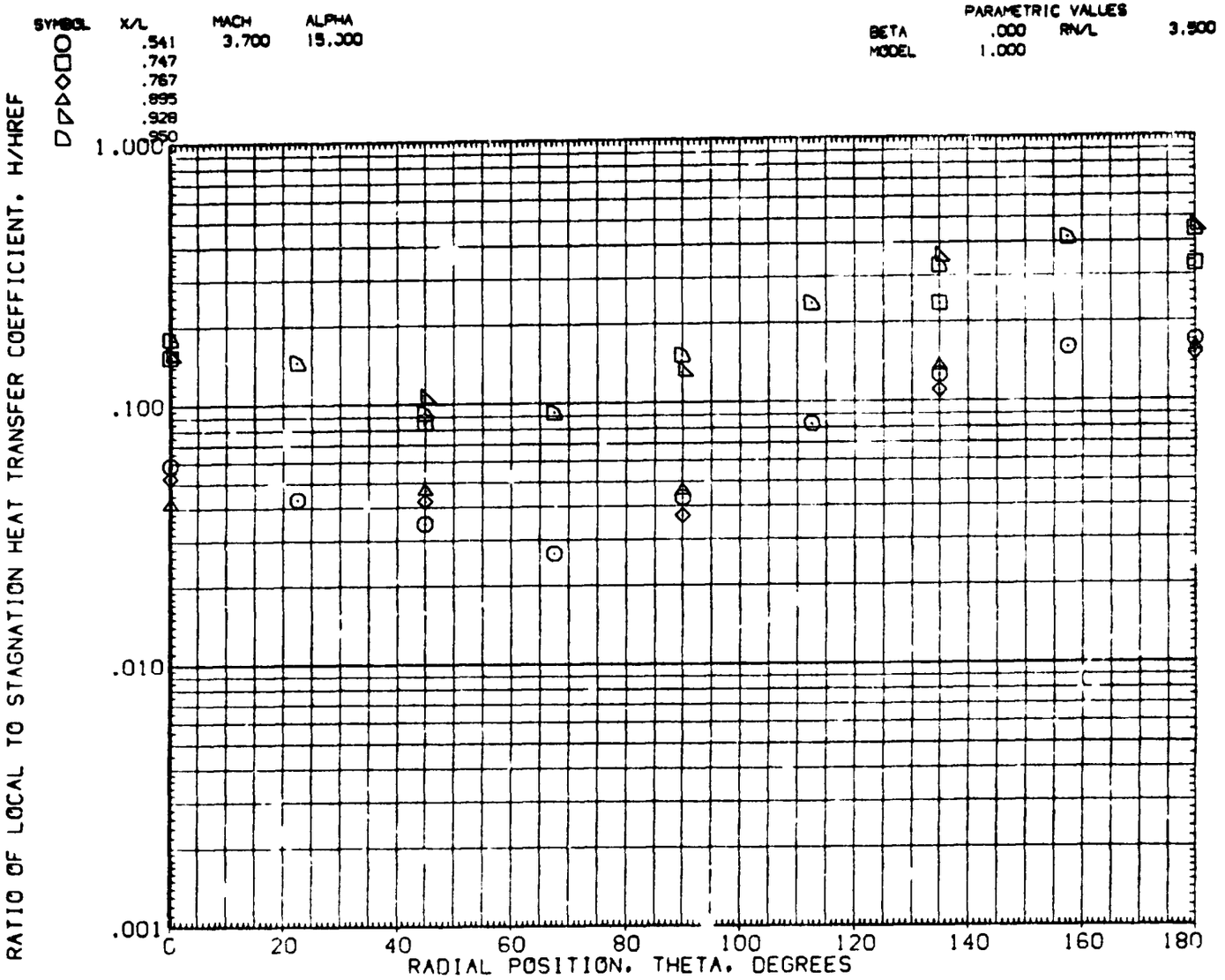


FIGURE 8 H/HREF RADIALLY AT VARIOUS X/L STATIONS(WITH BOUNDRY LAYER TRIP)

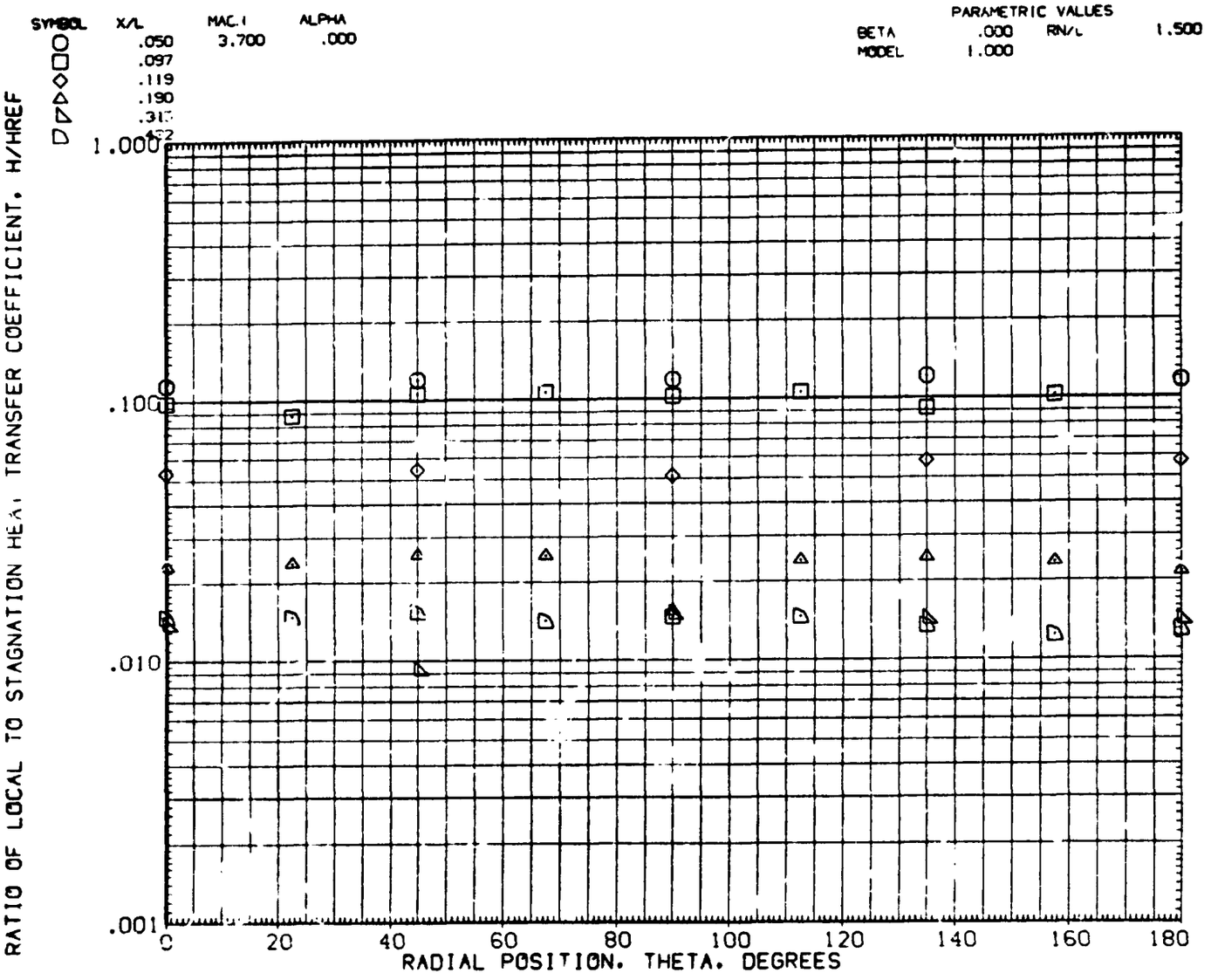


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP.RN/L=1.5)

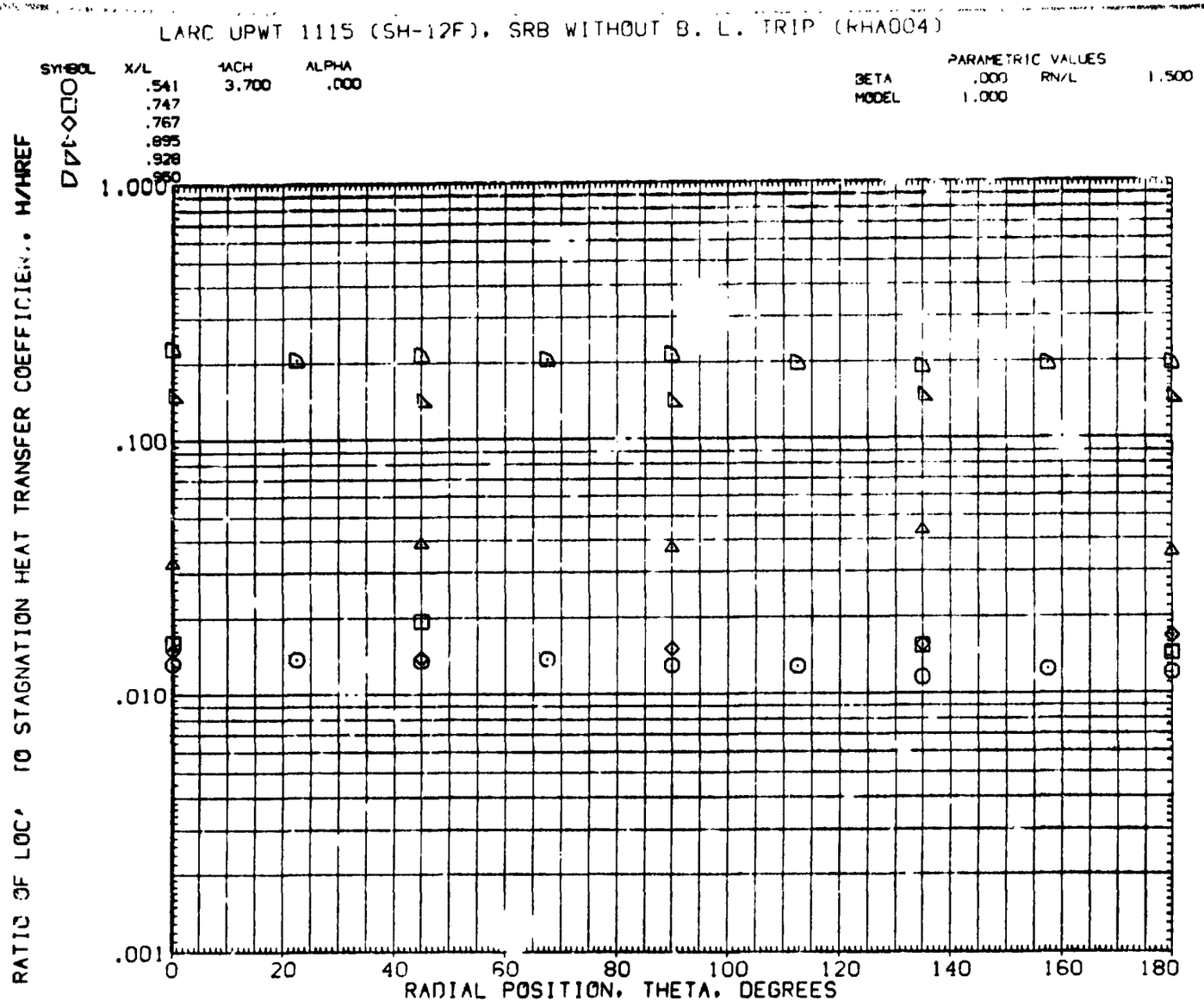


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)

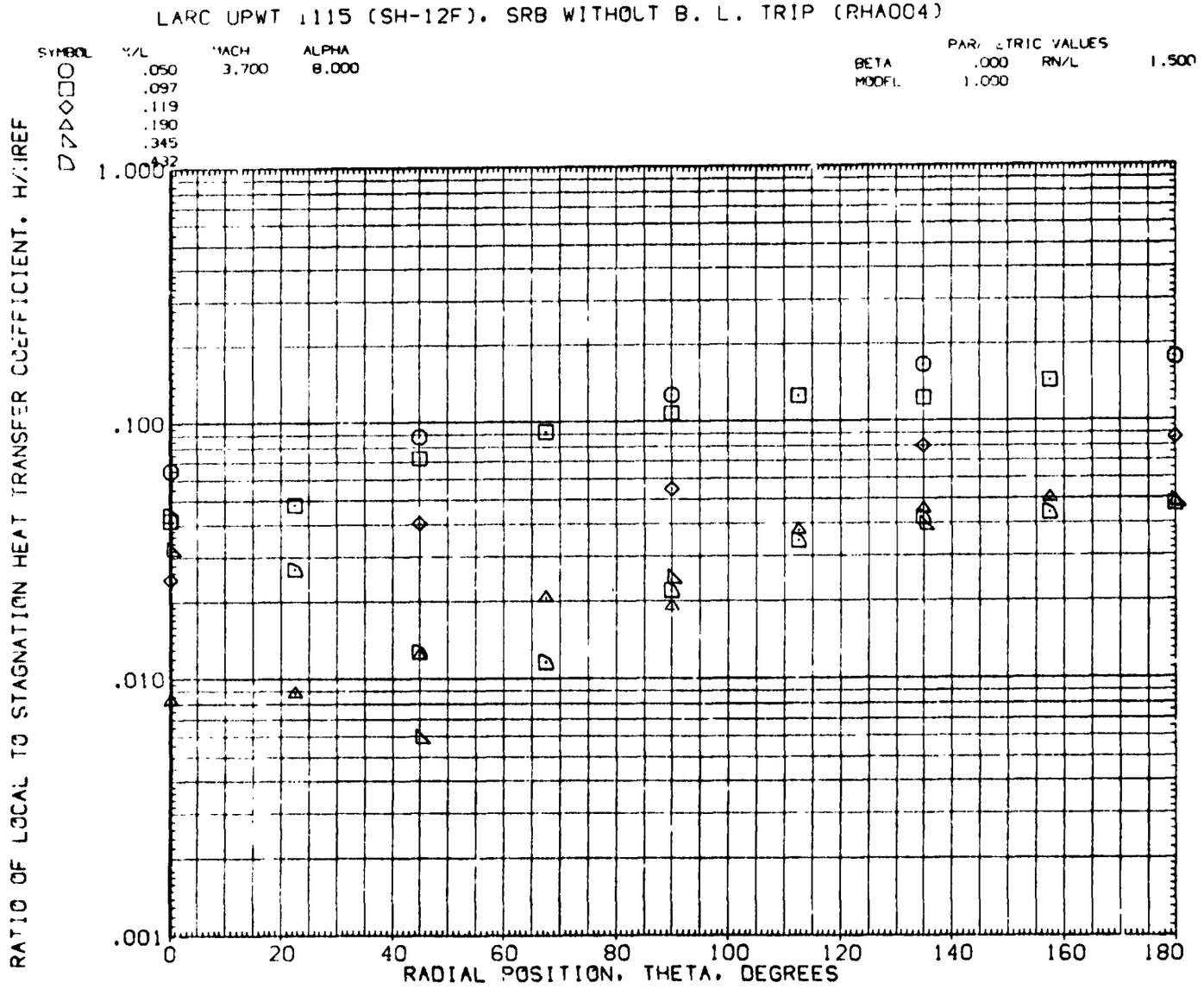
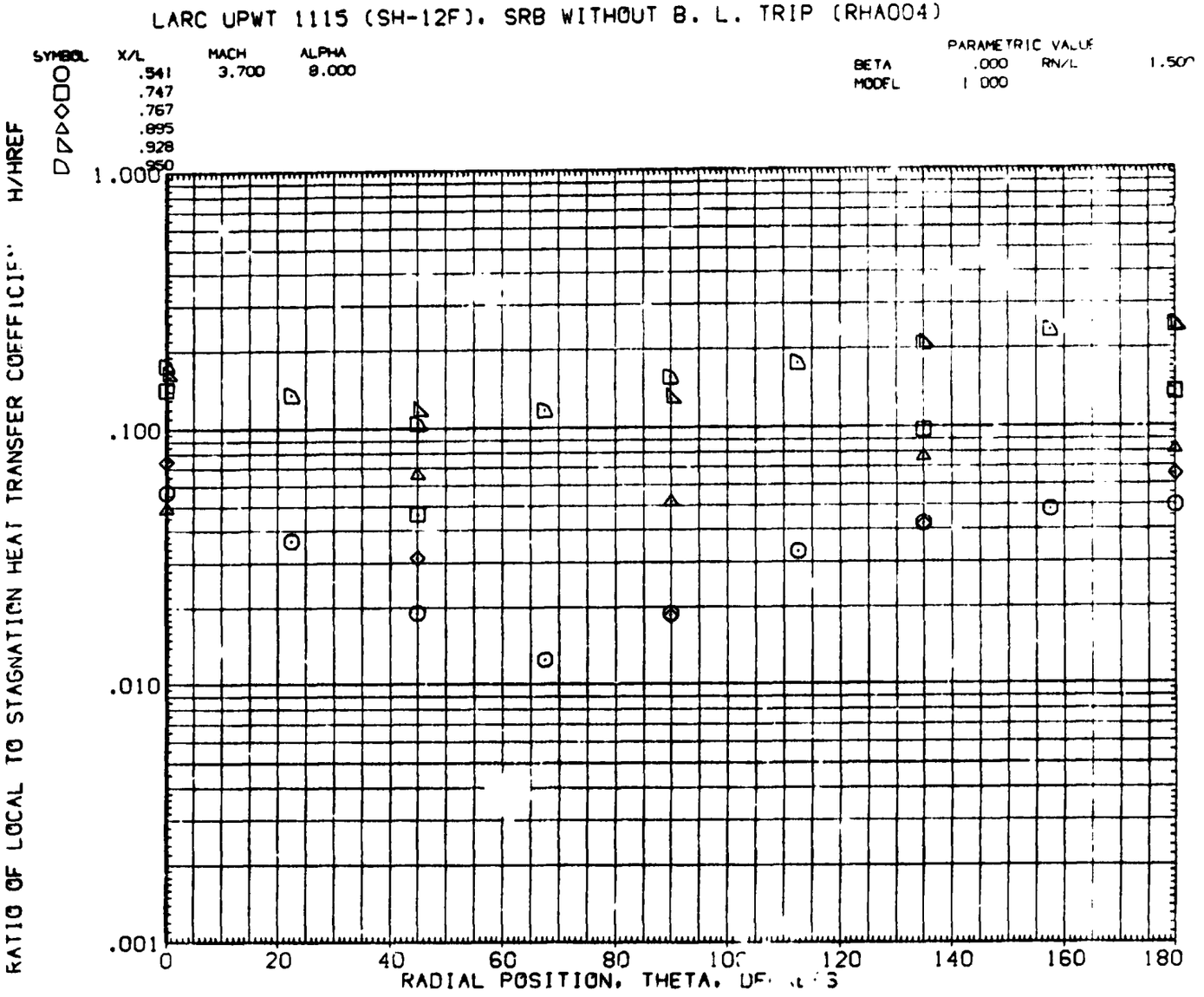


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)



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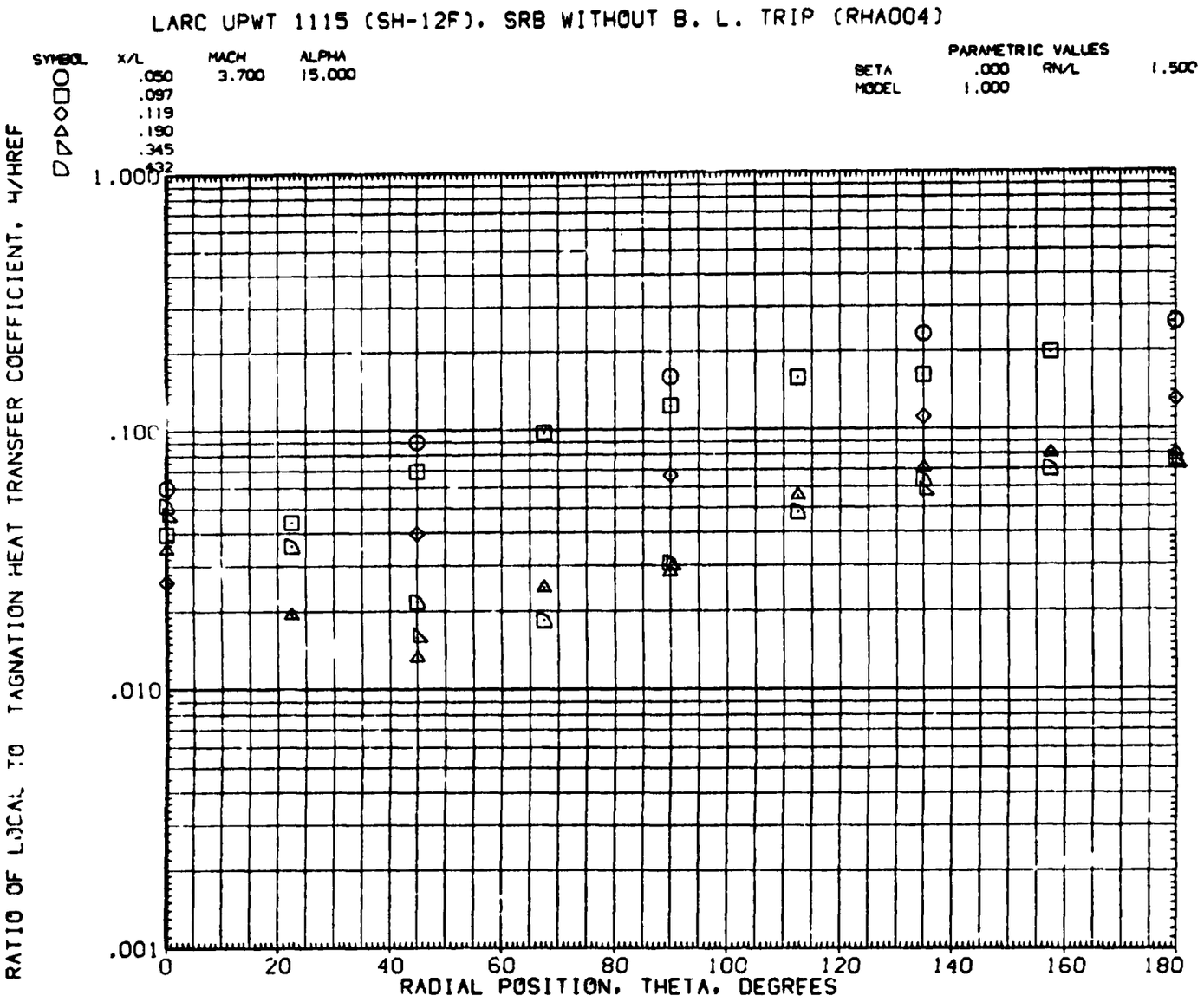

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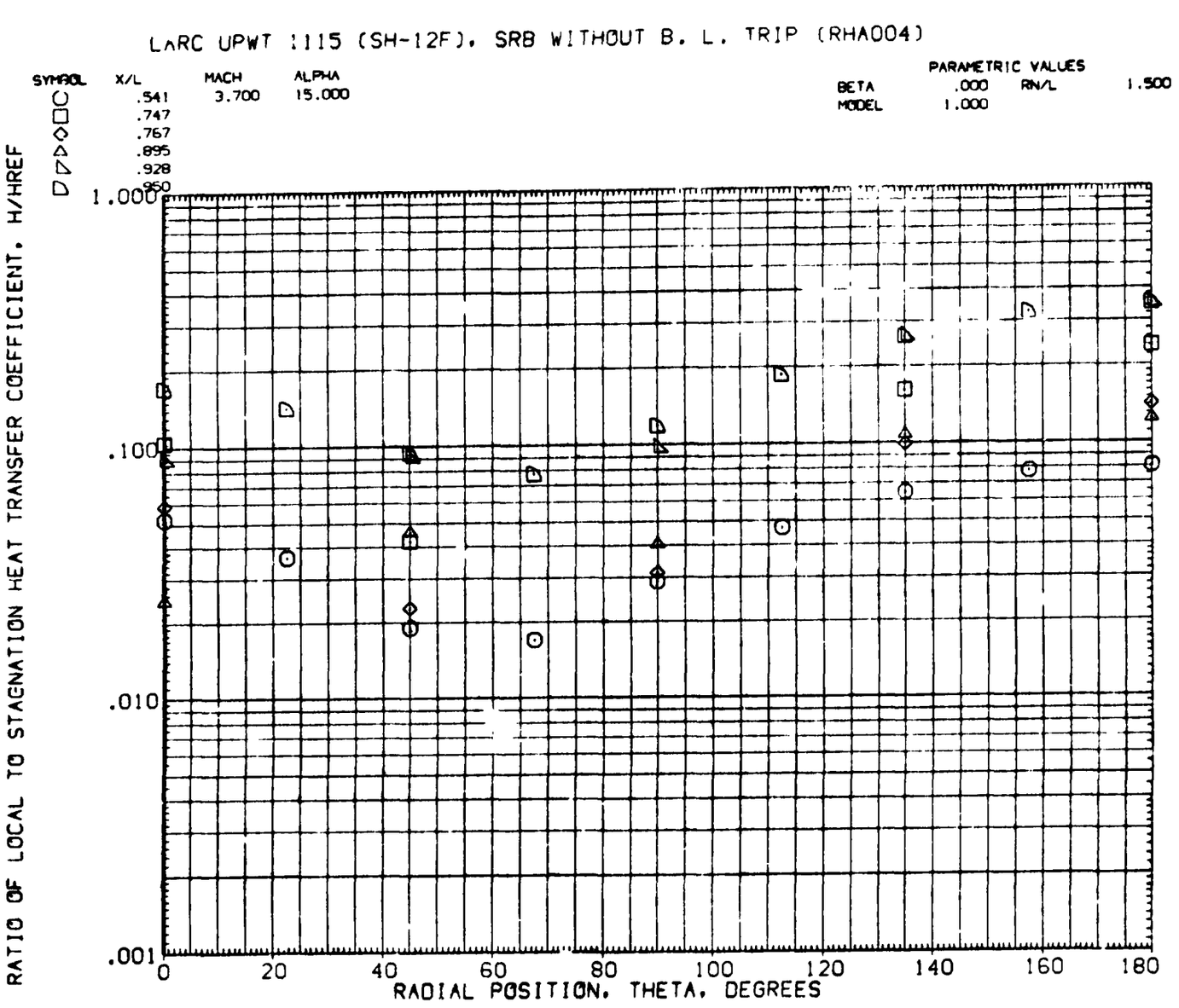
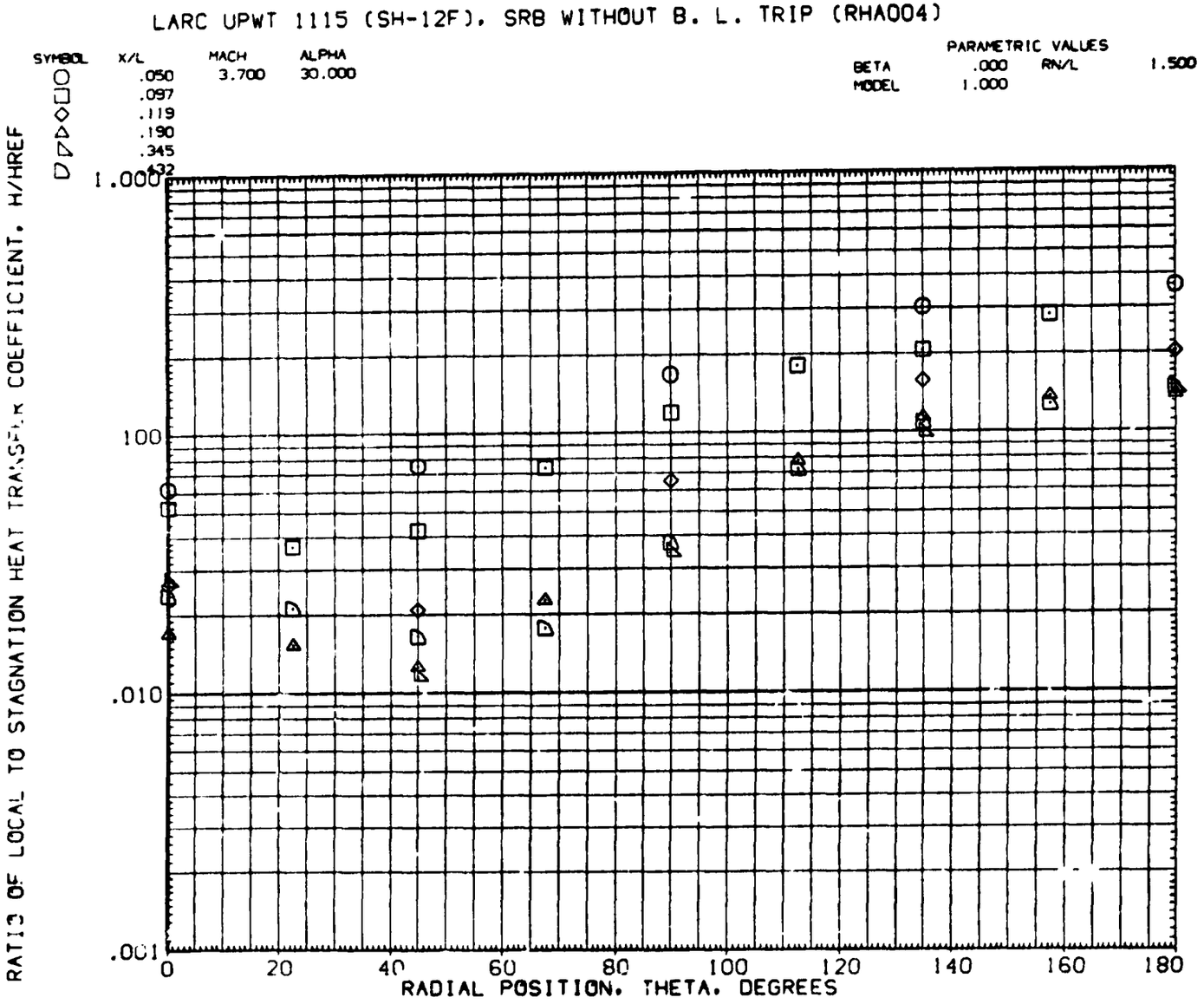


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)



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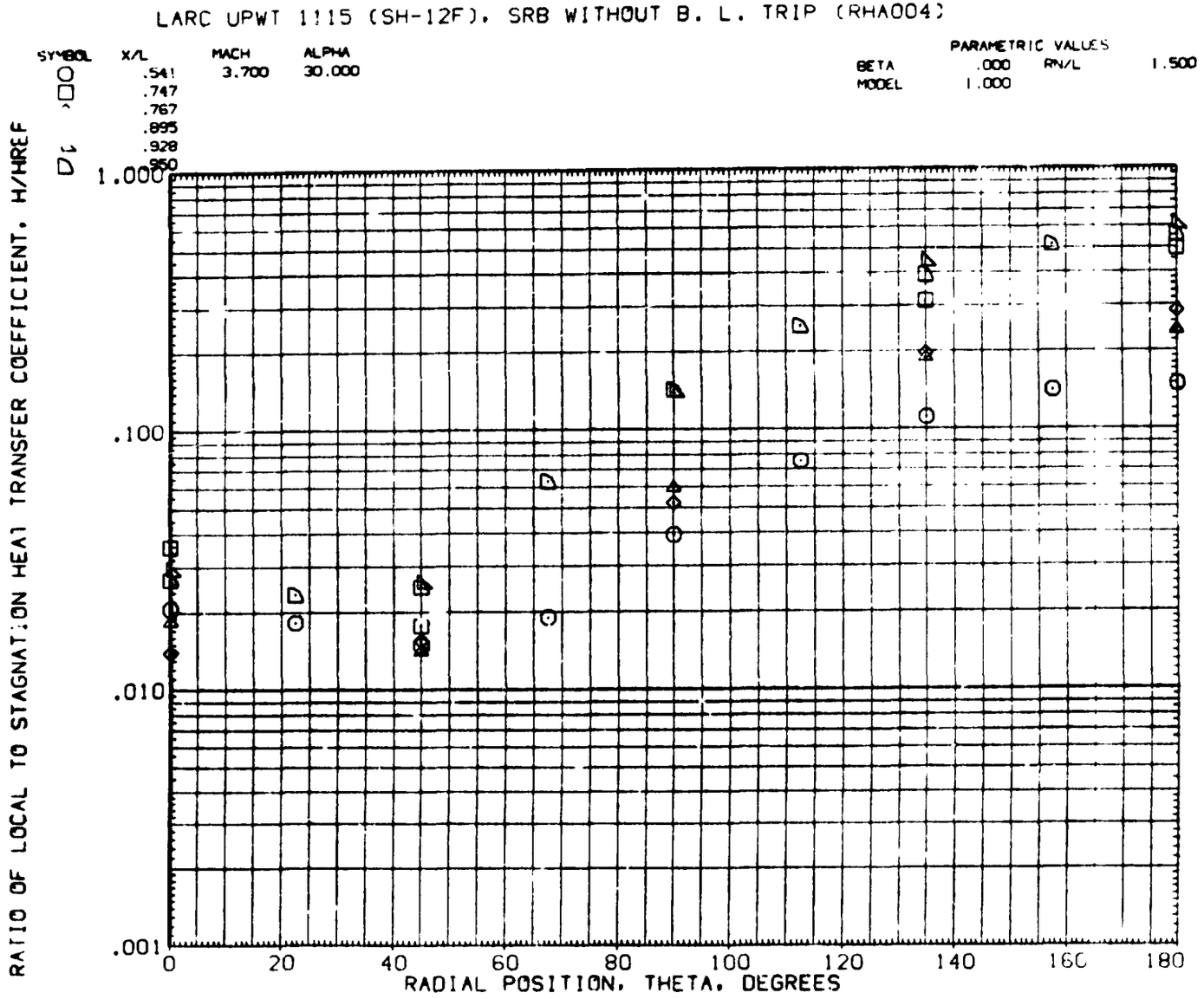

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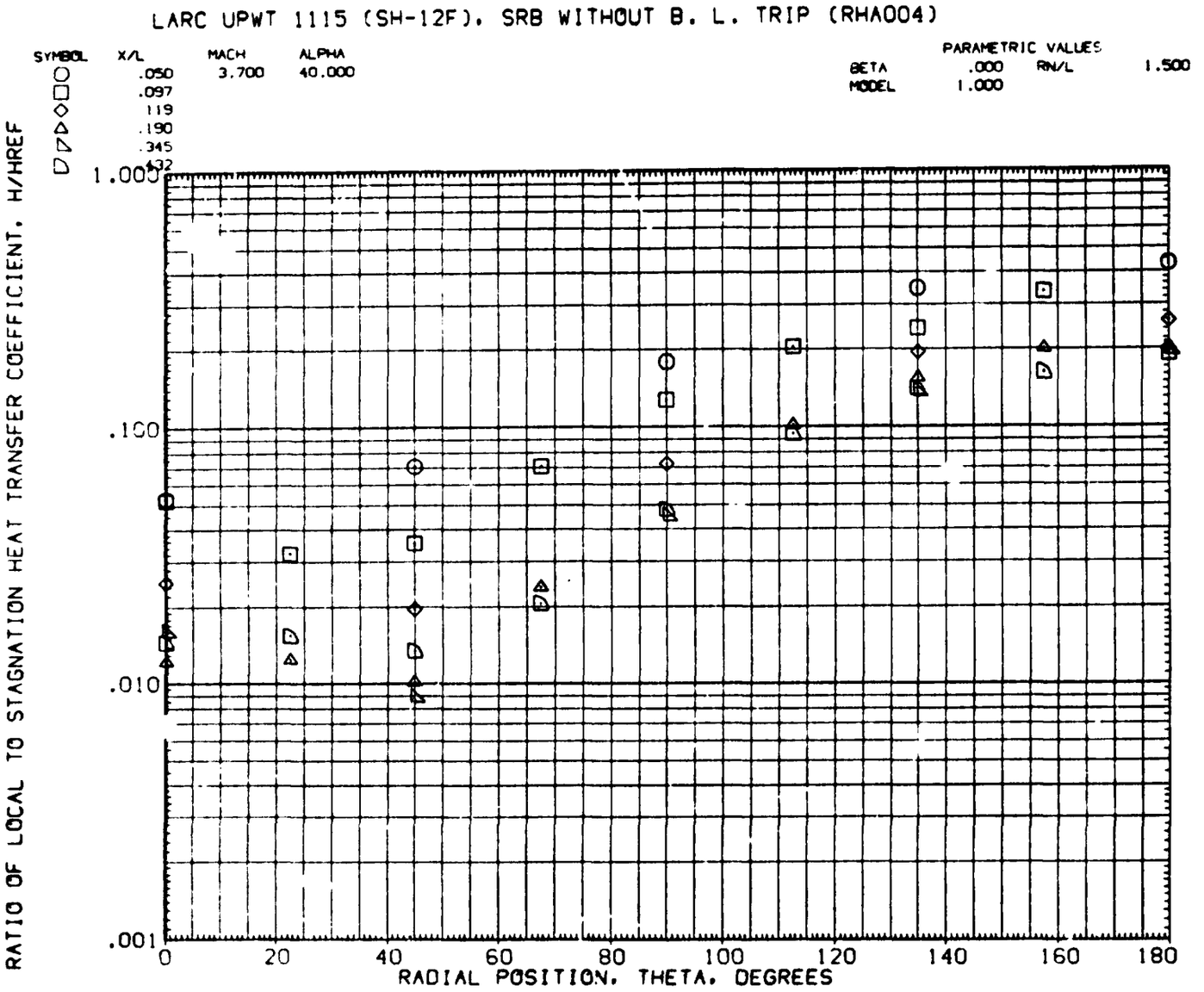


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP.RN/L=1.5)

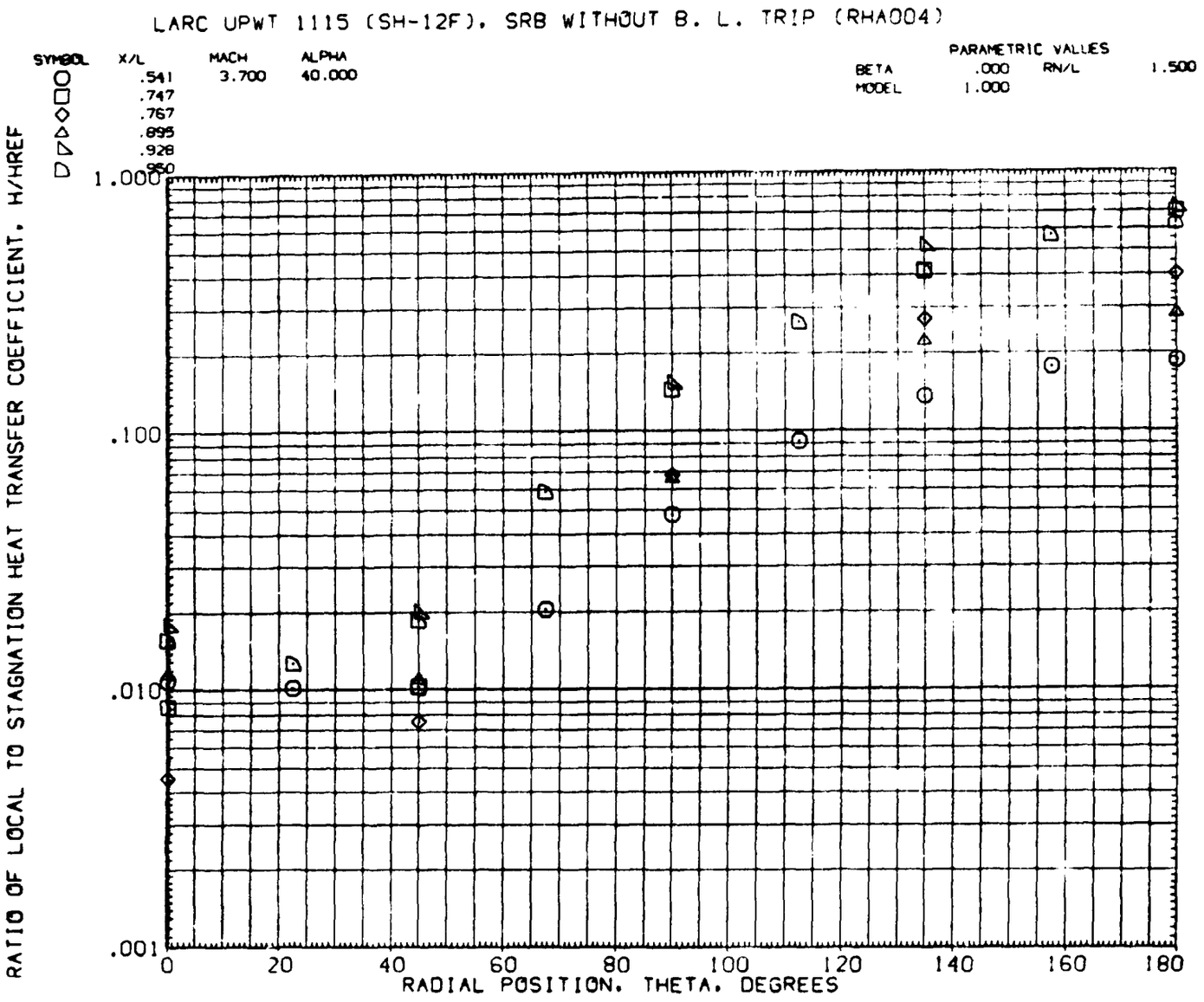
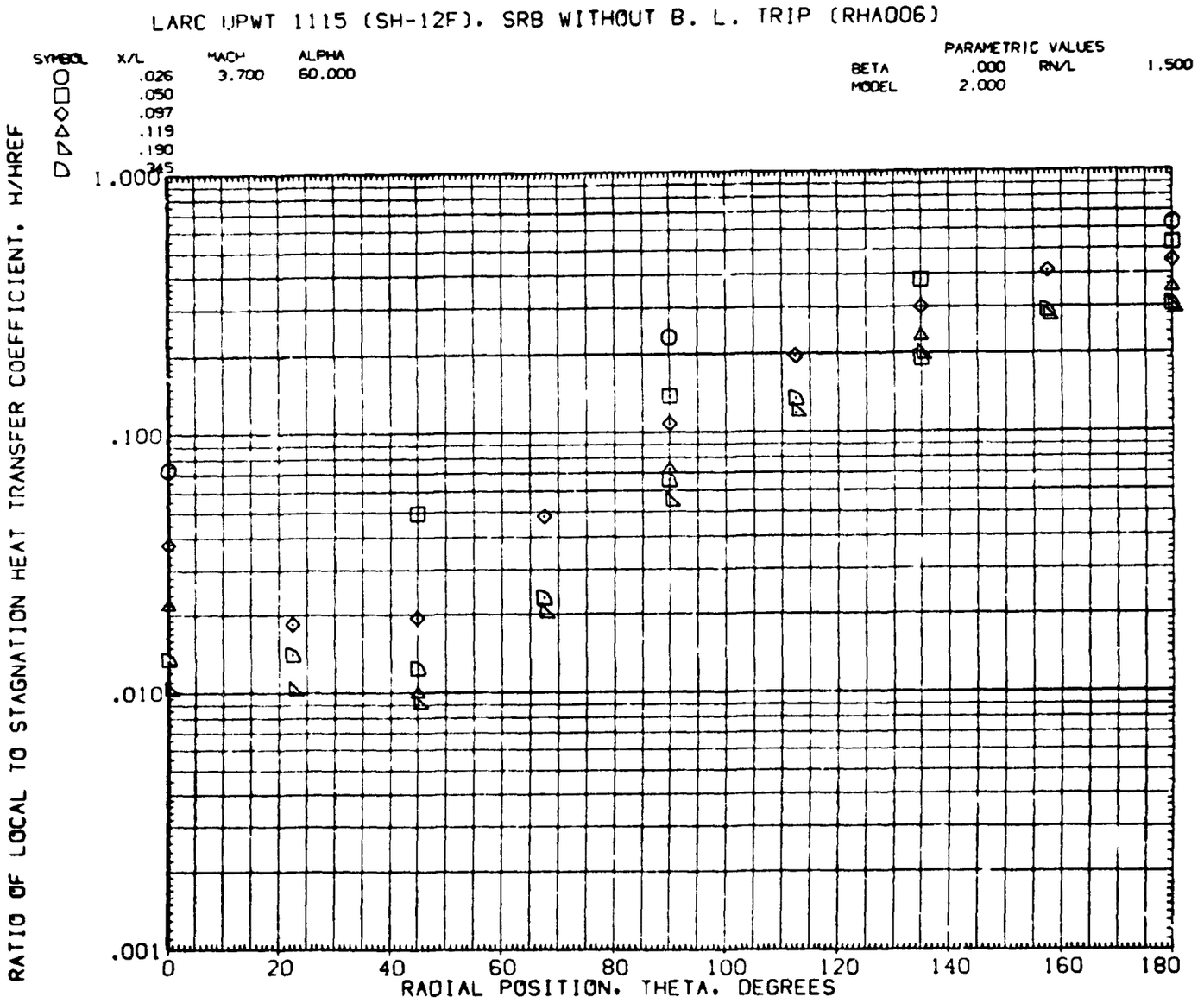


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)



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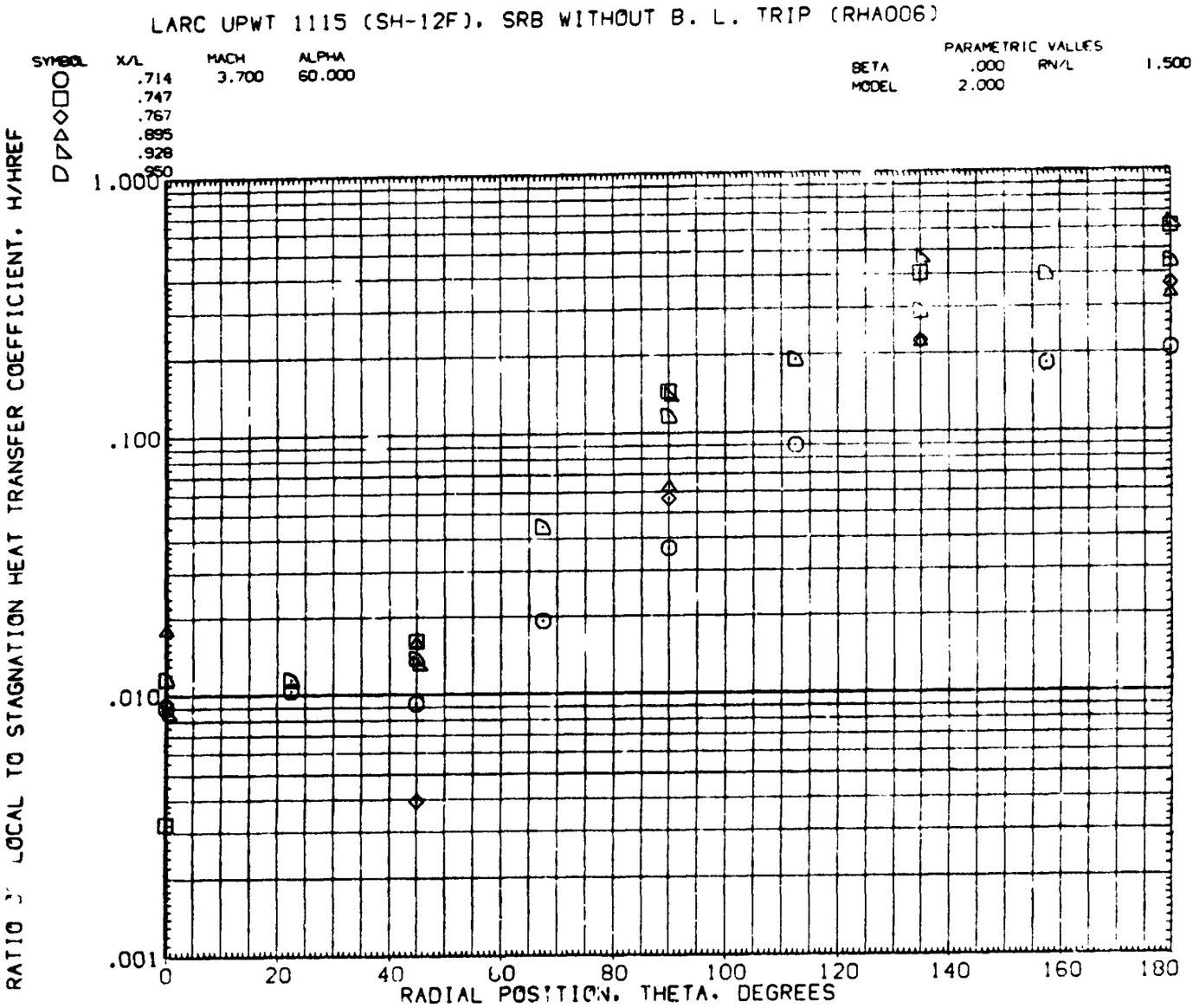

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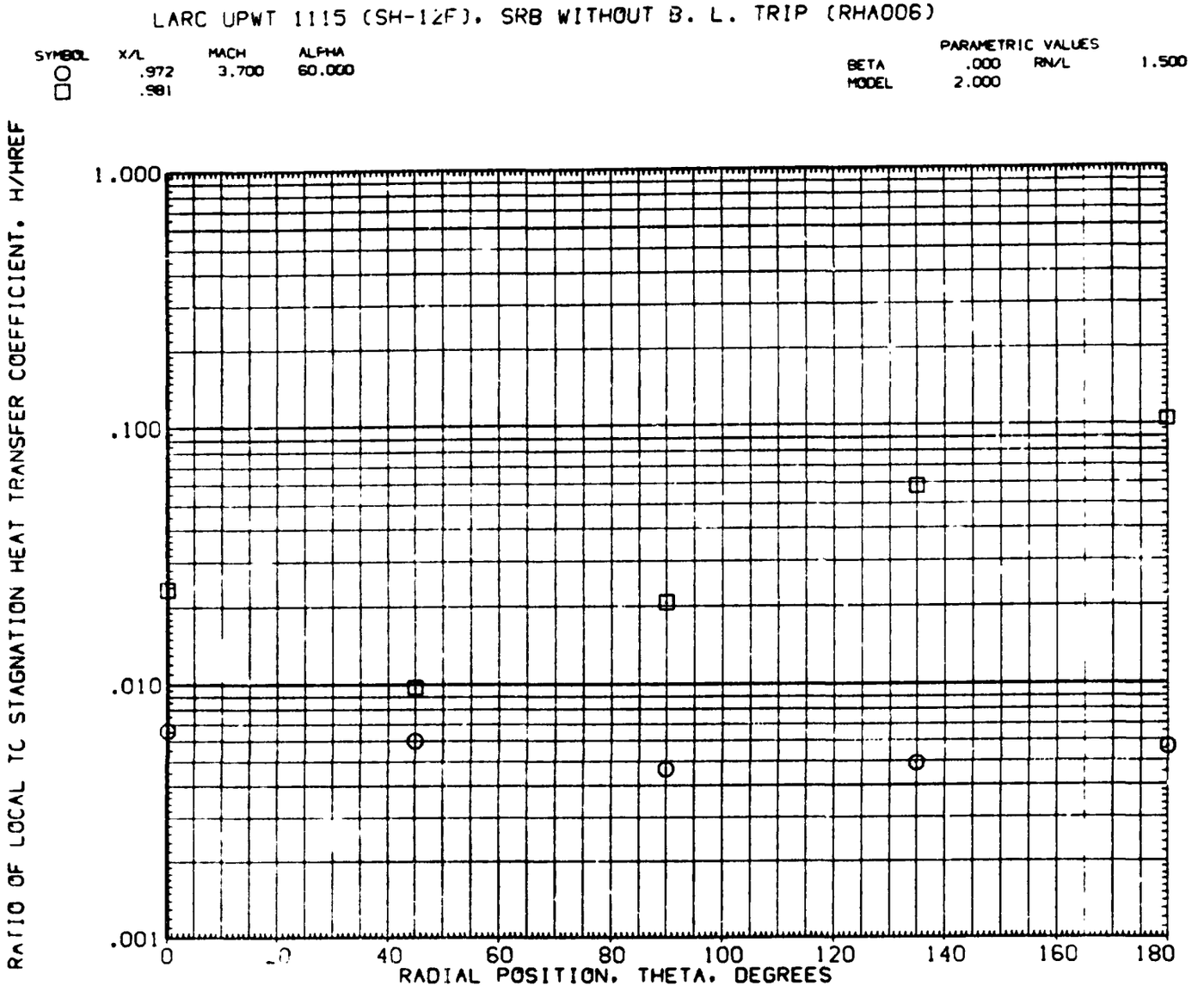
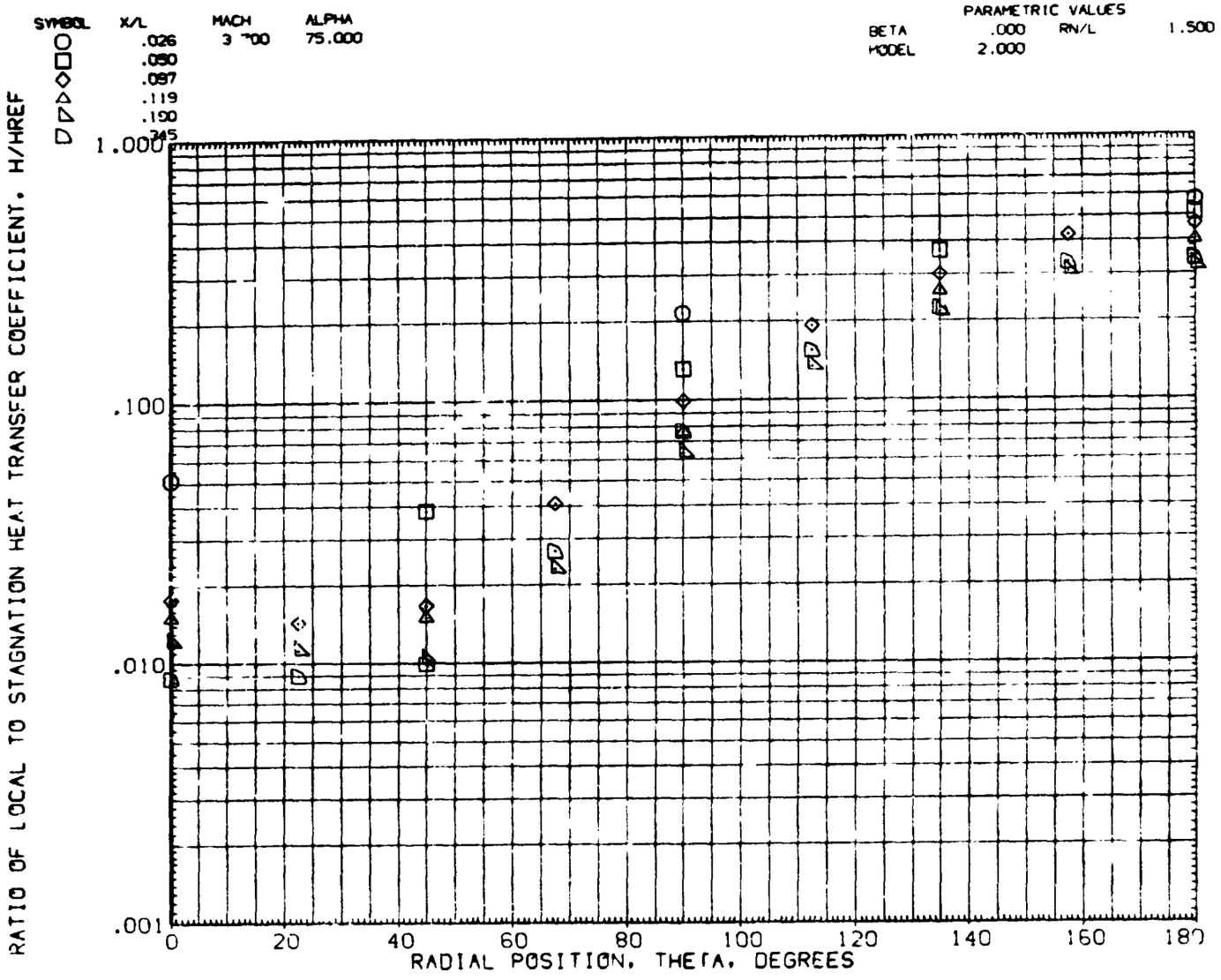


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)



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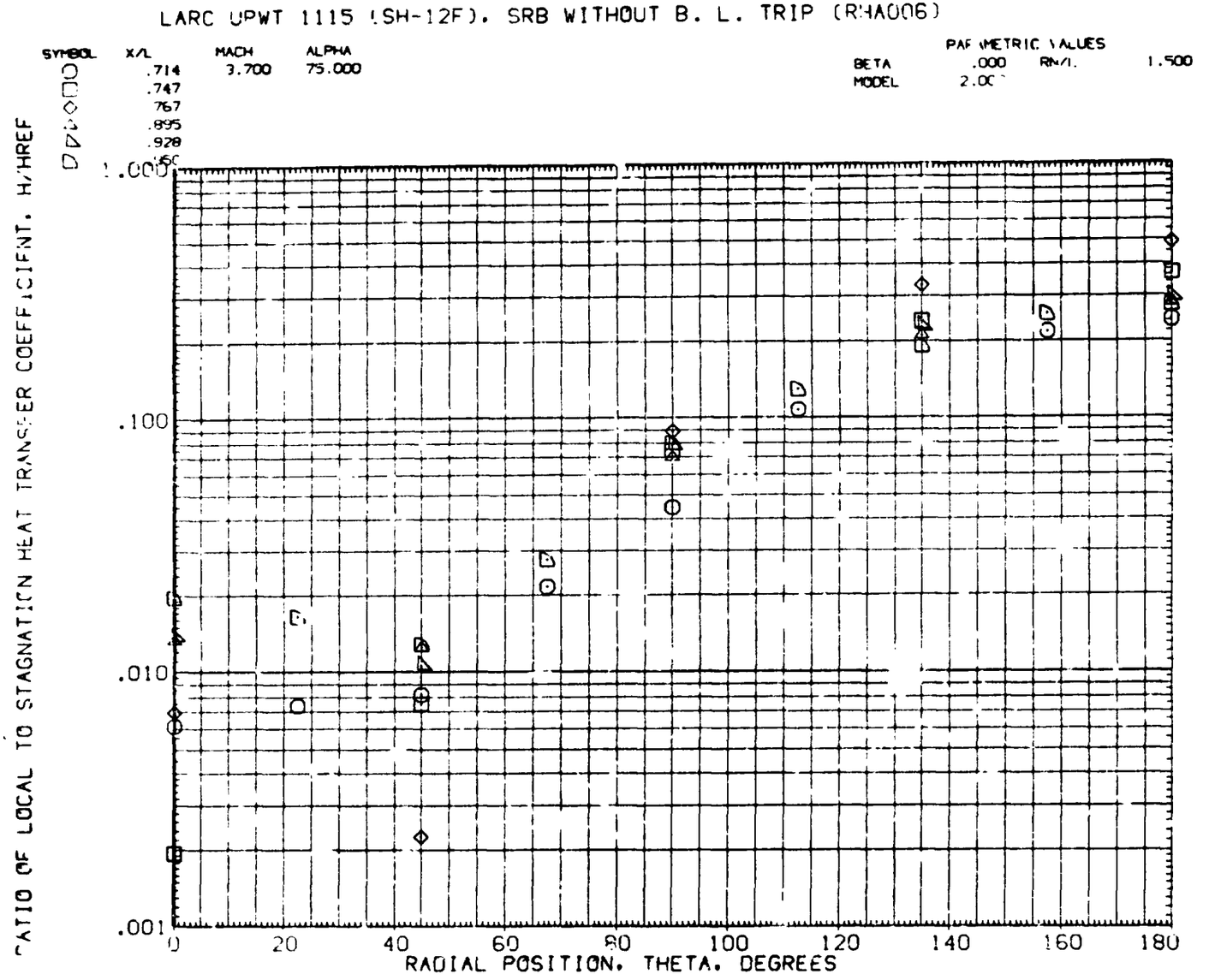

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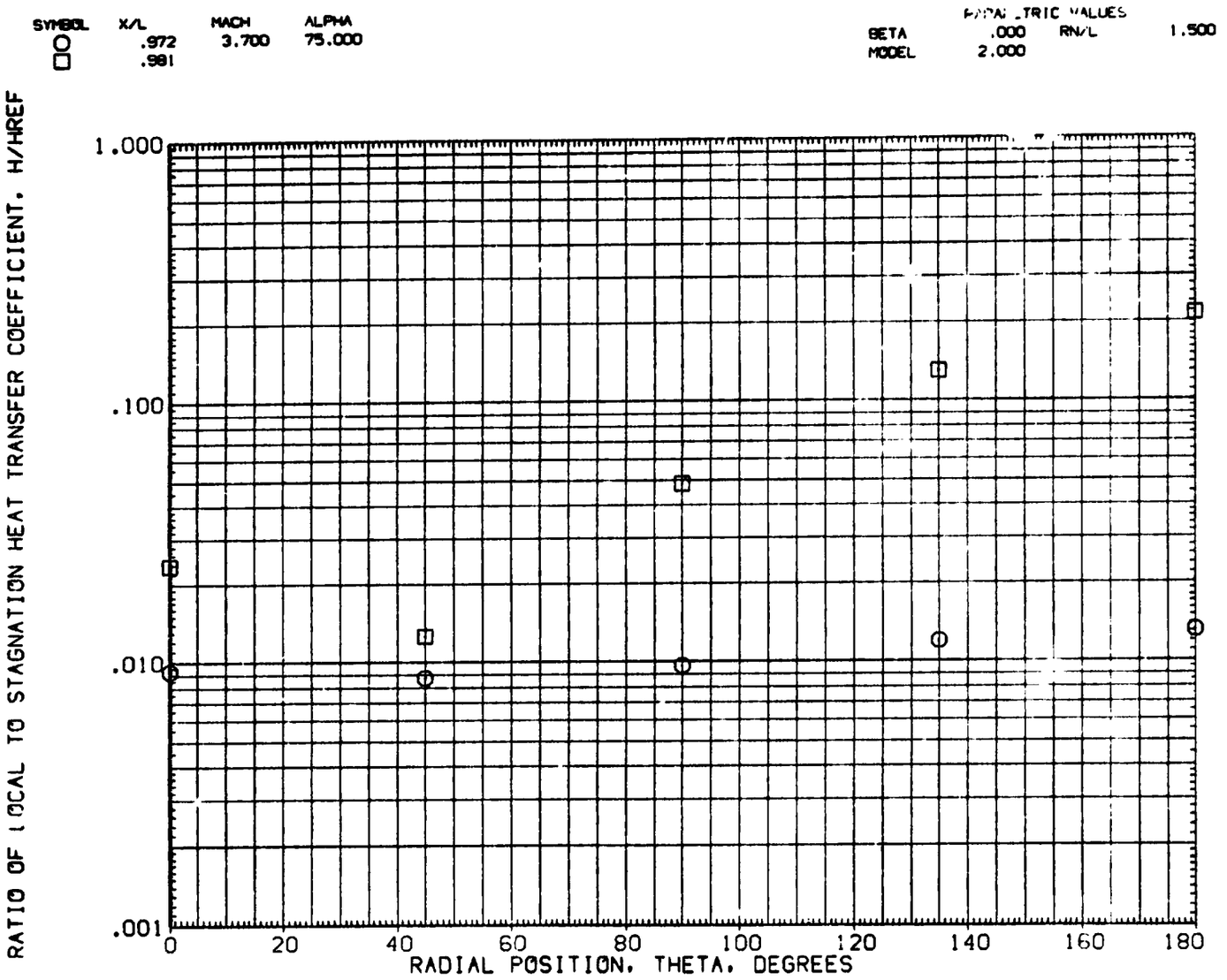

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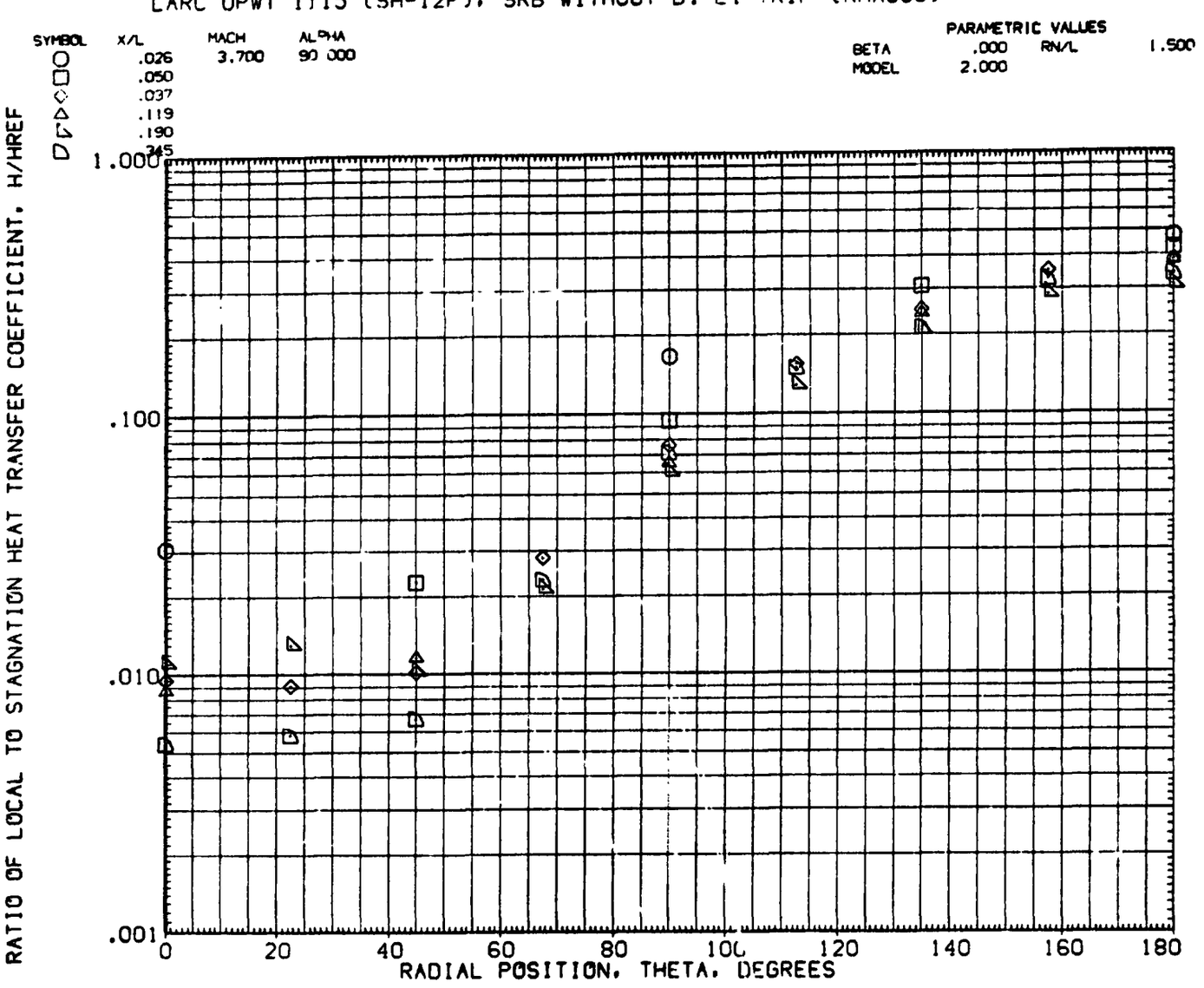

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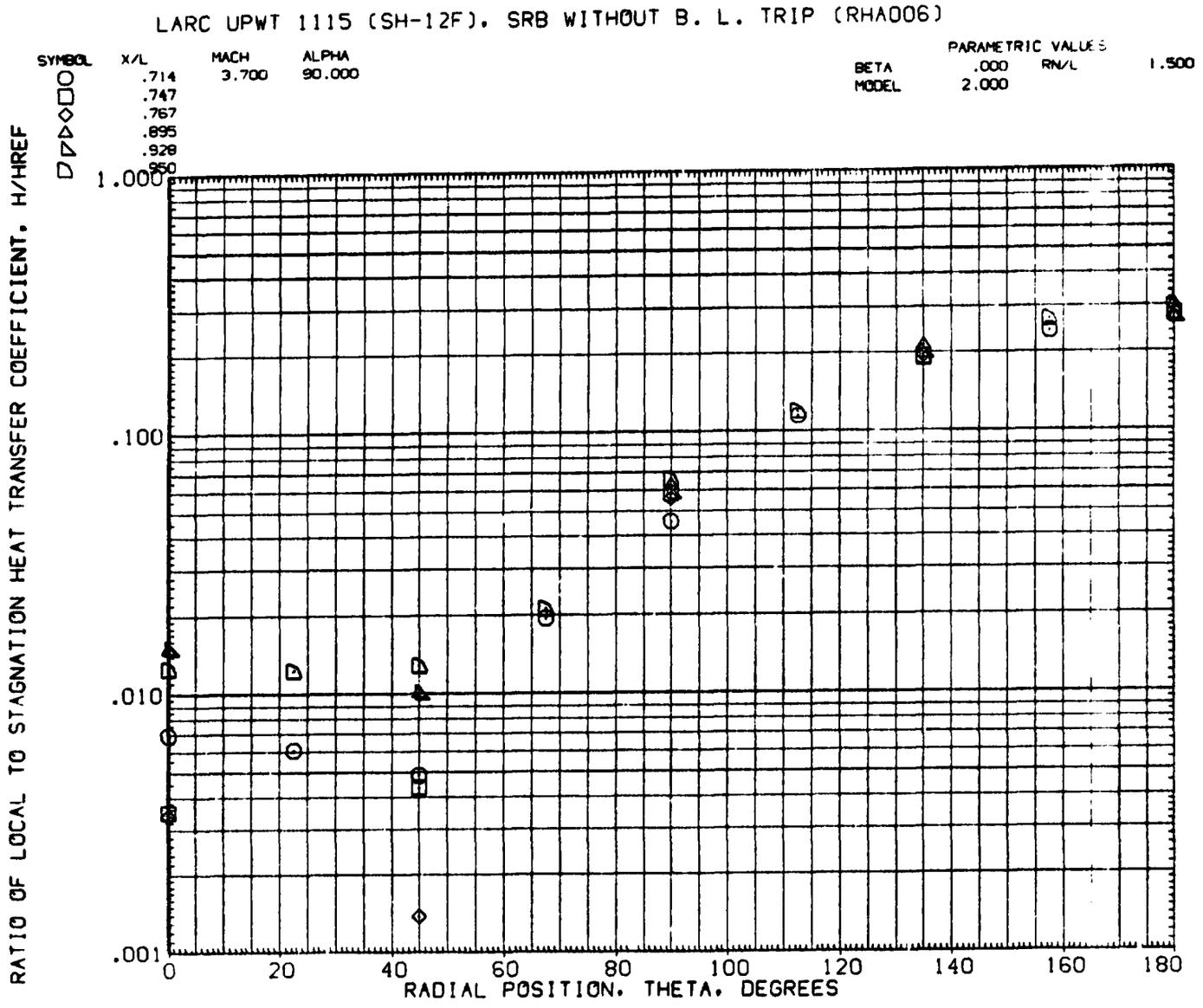

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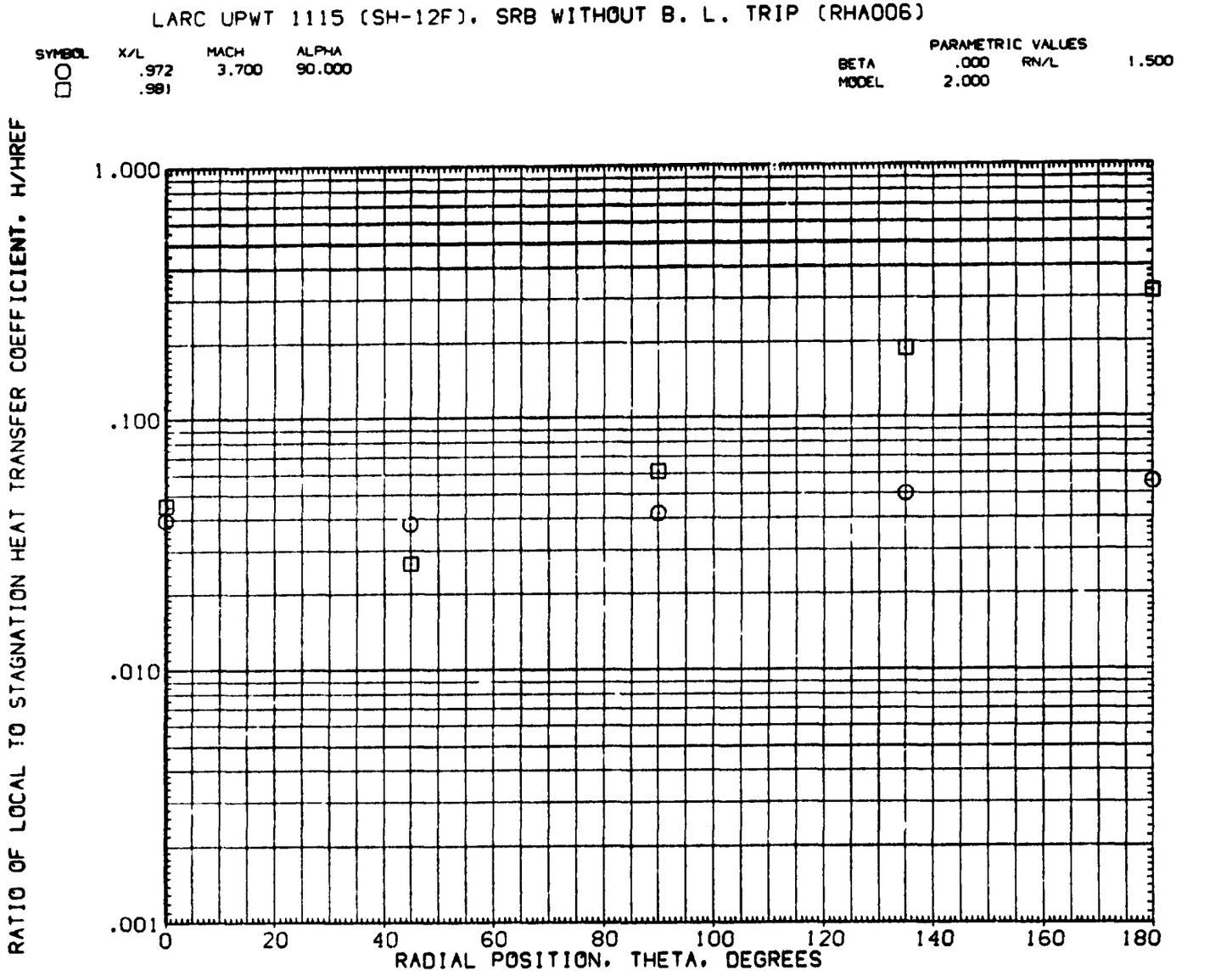
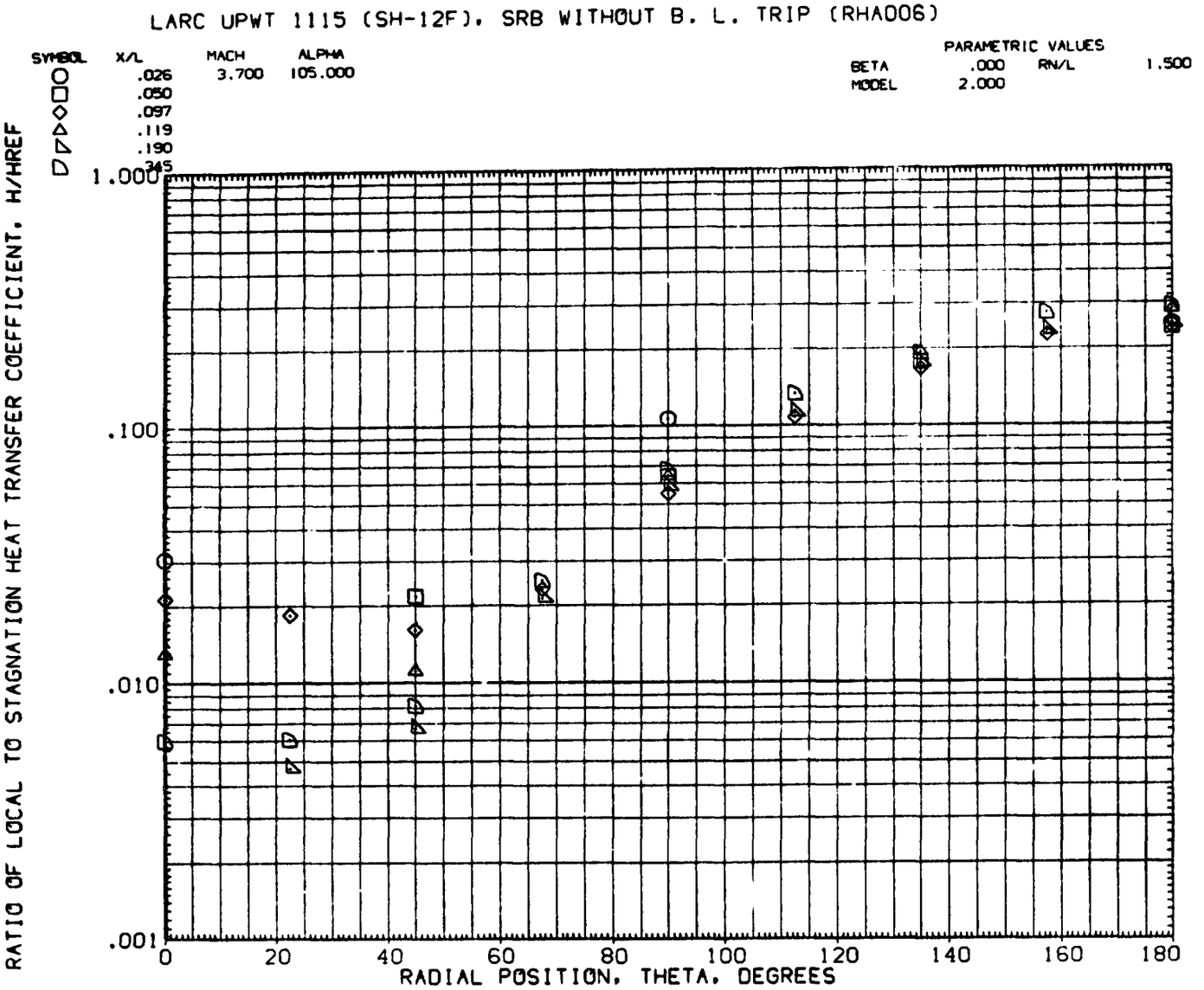


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP.RN/L=1.5)



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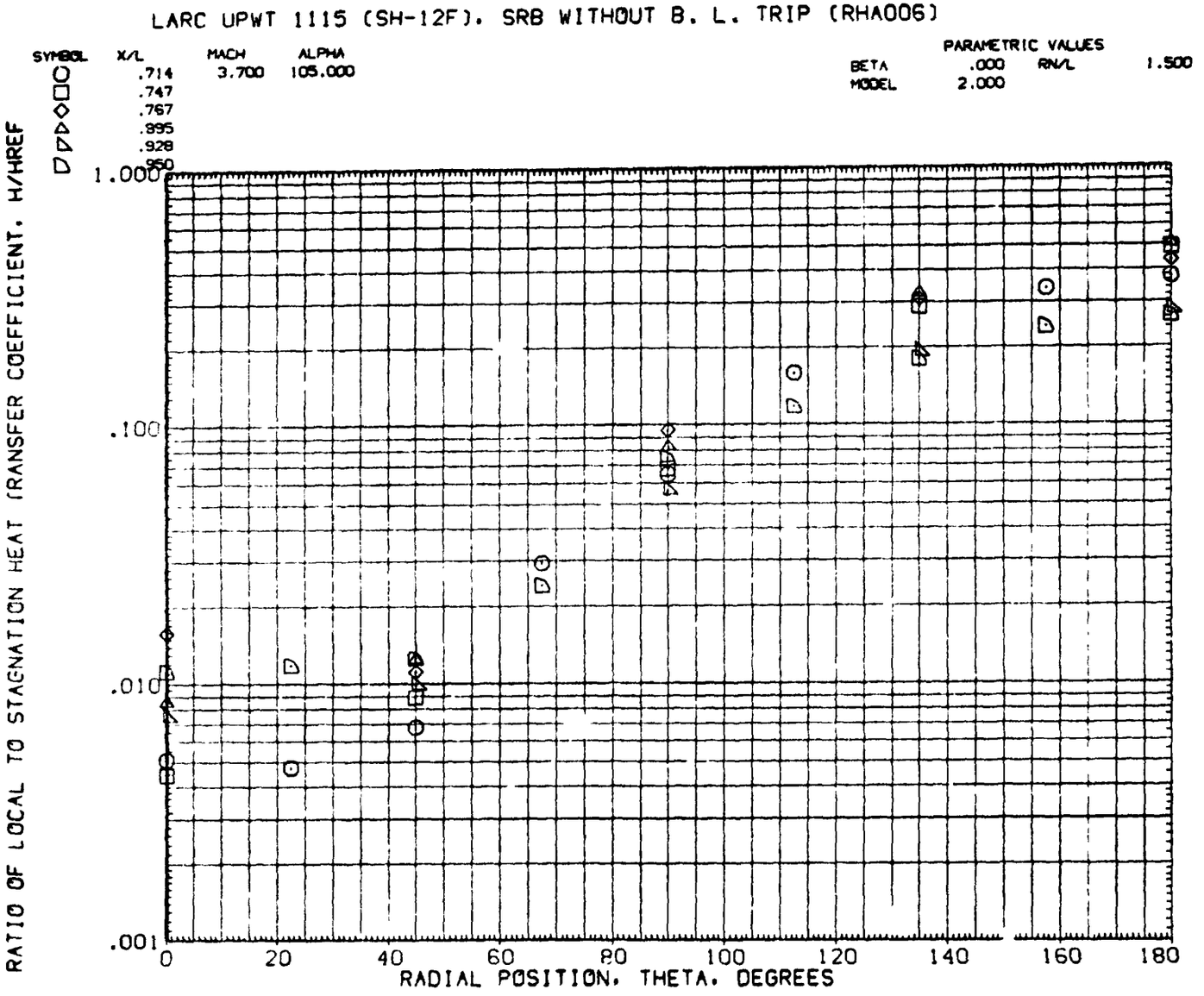

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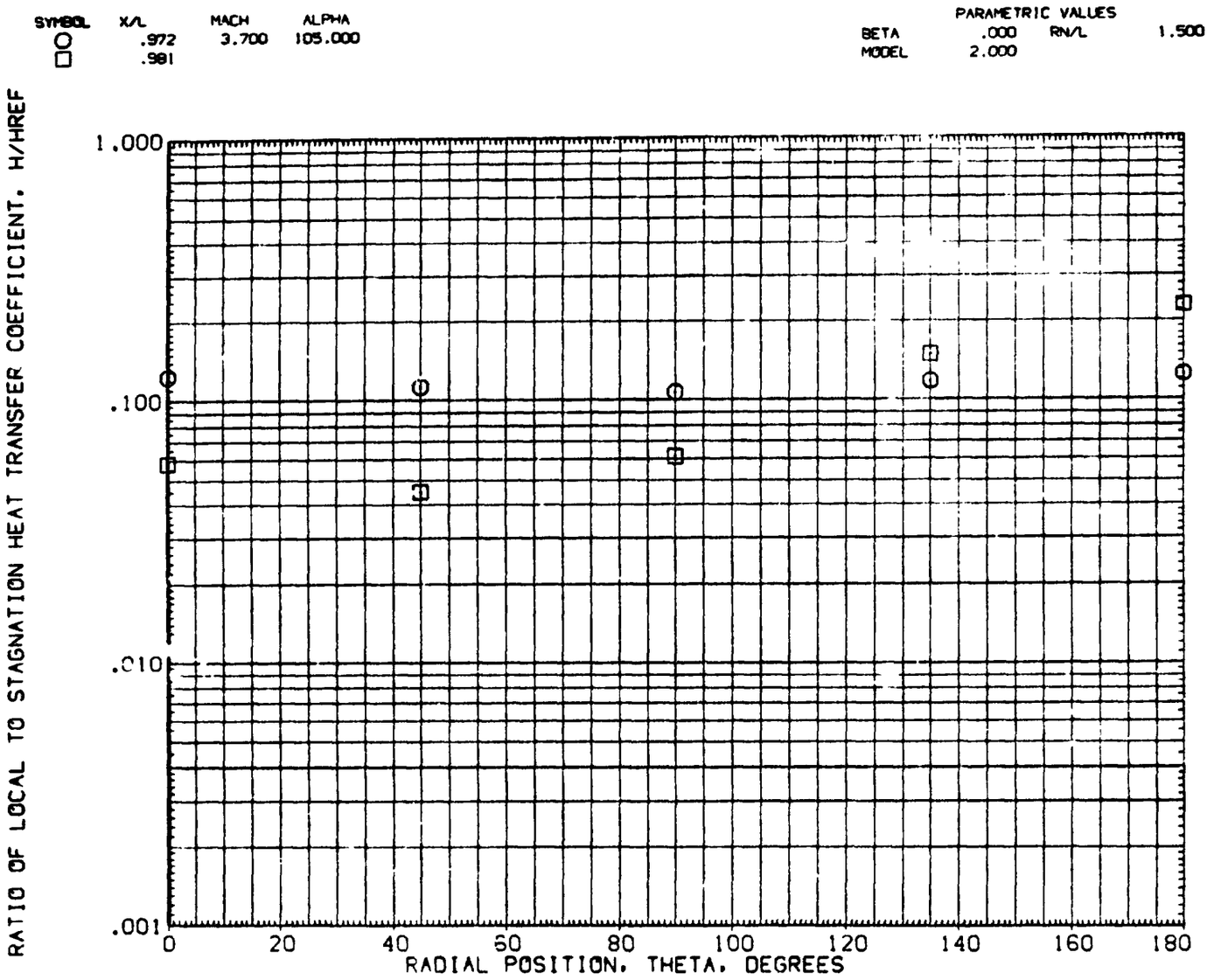

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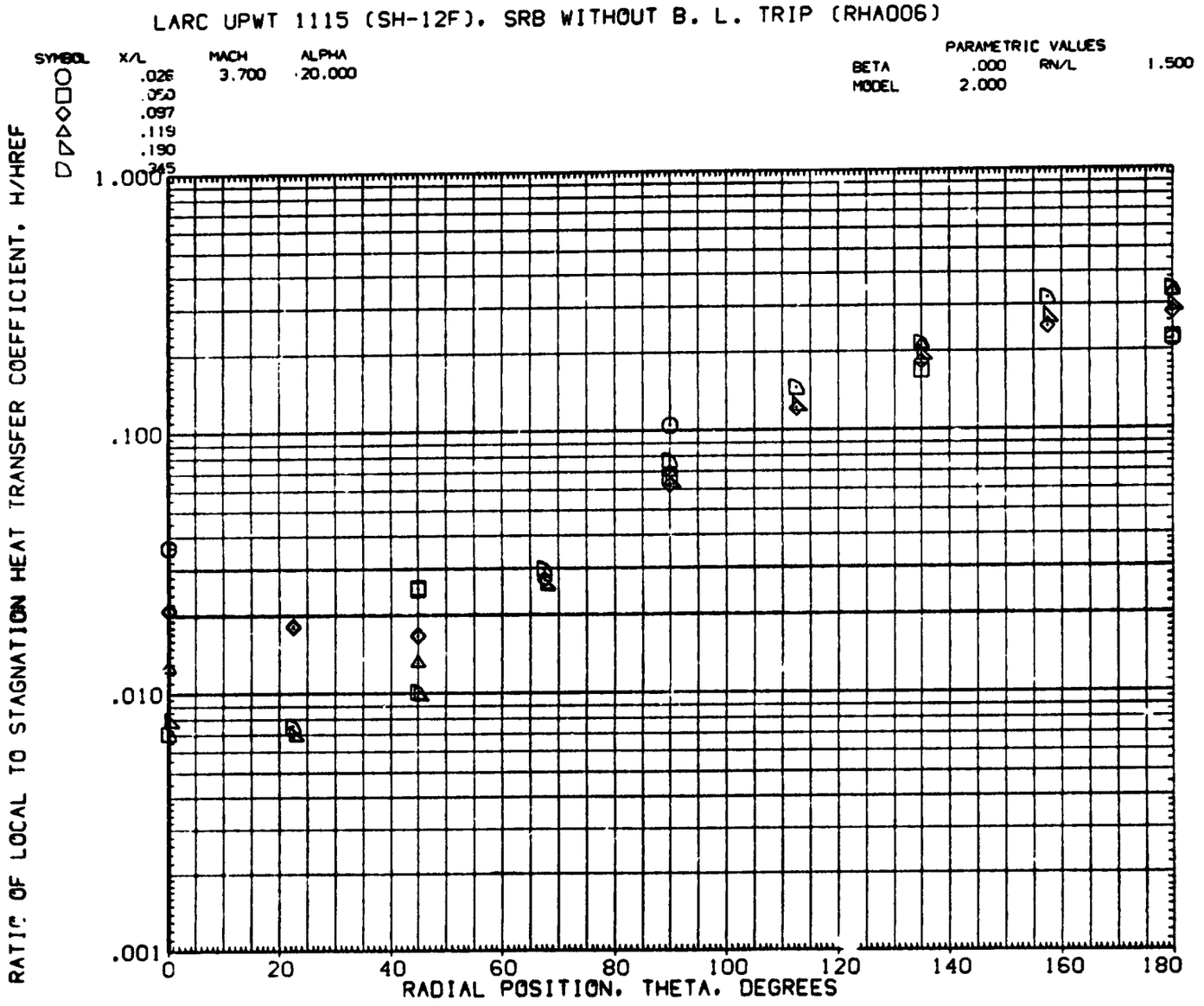

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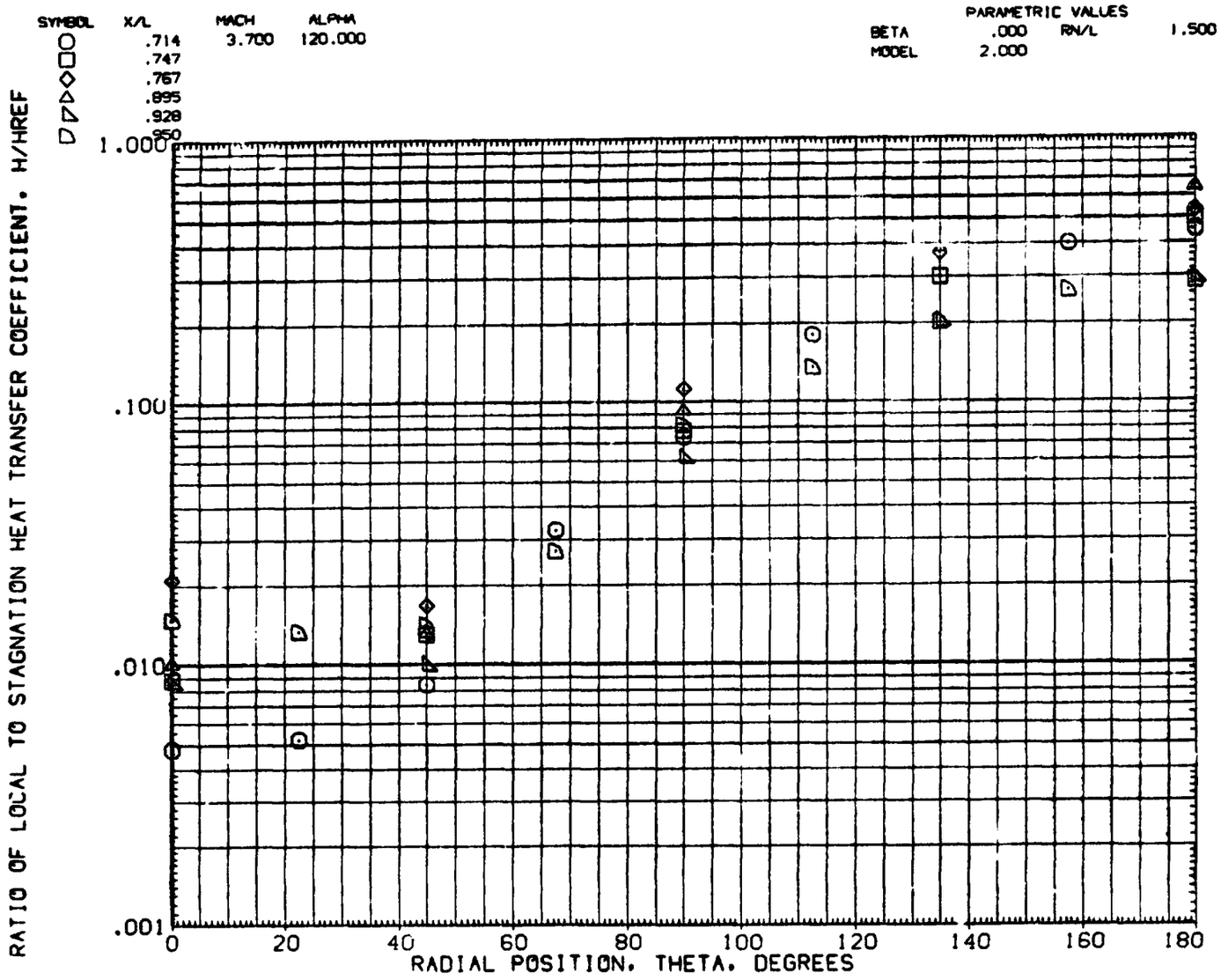

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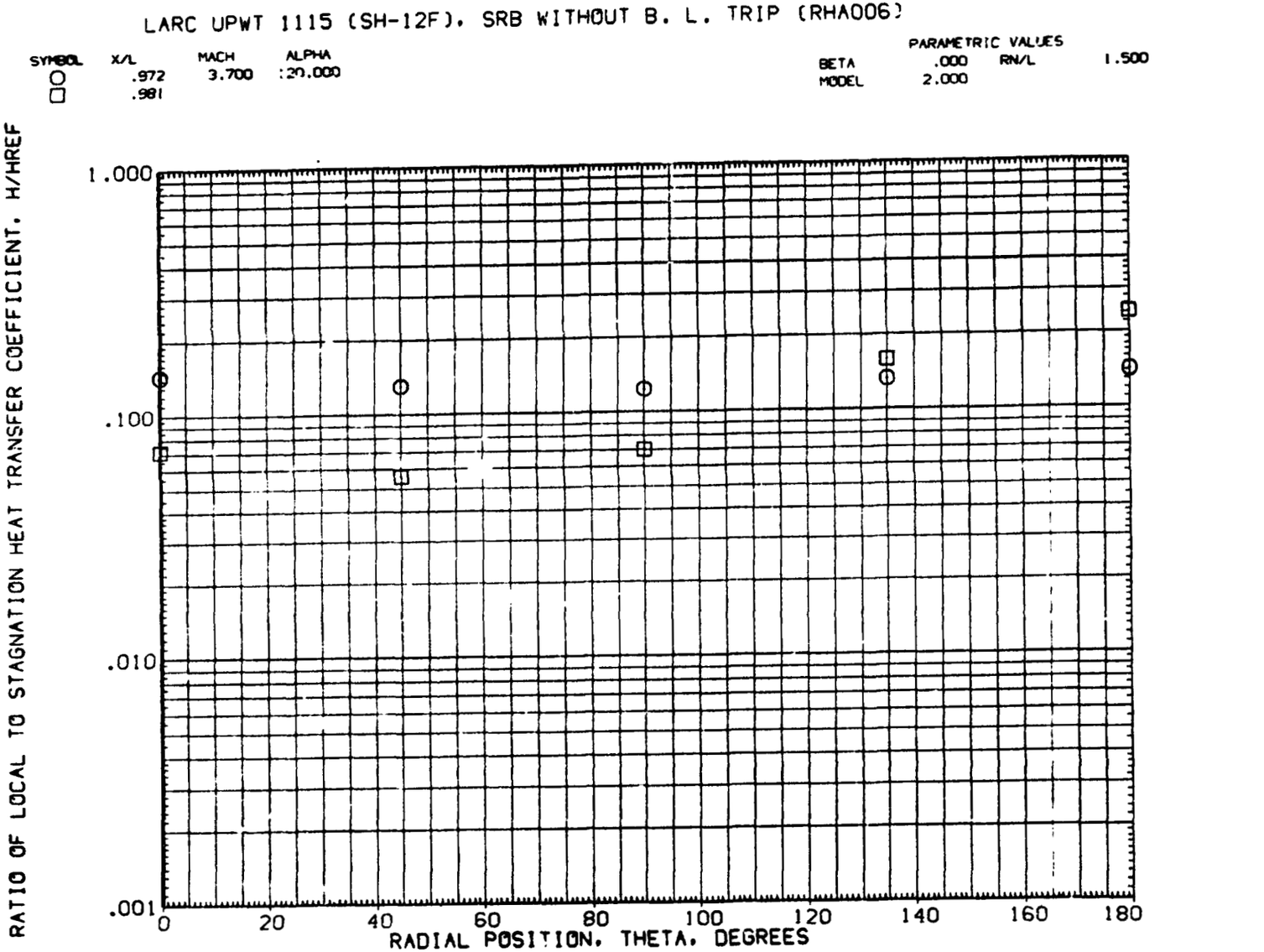


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)

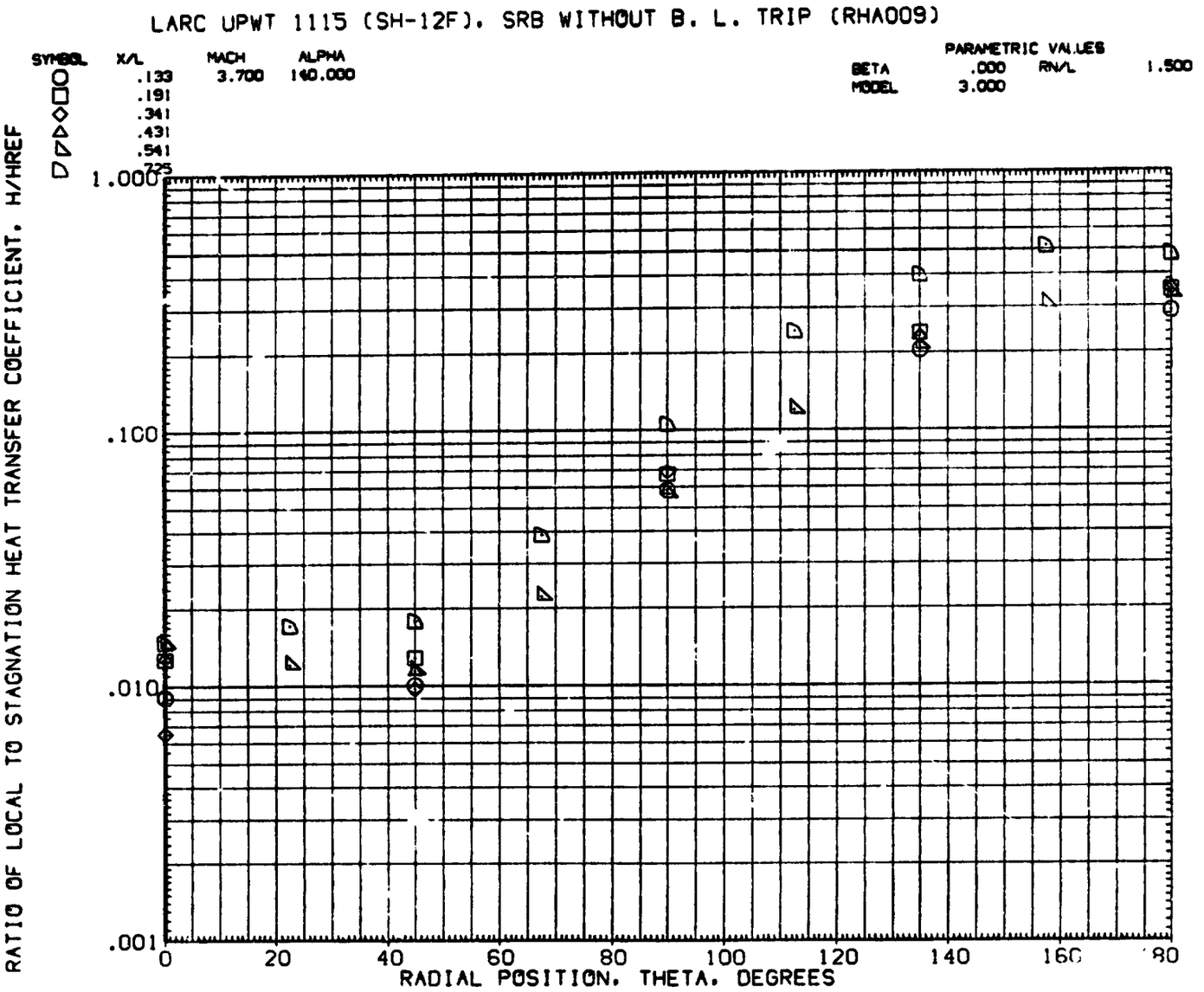


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1)

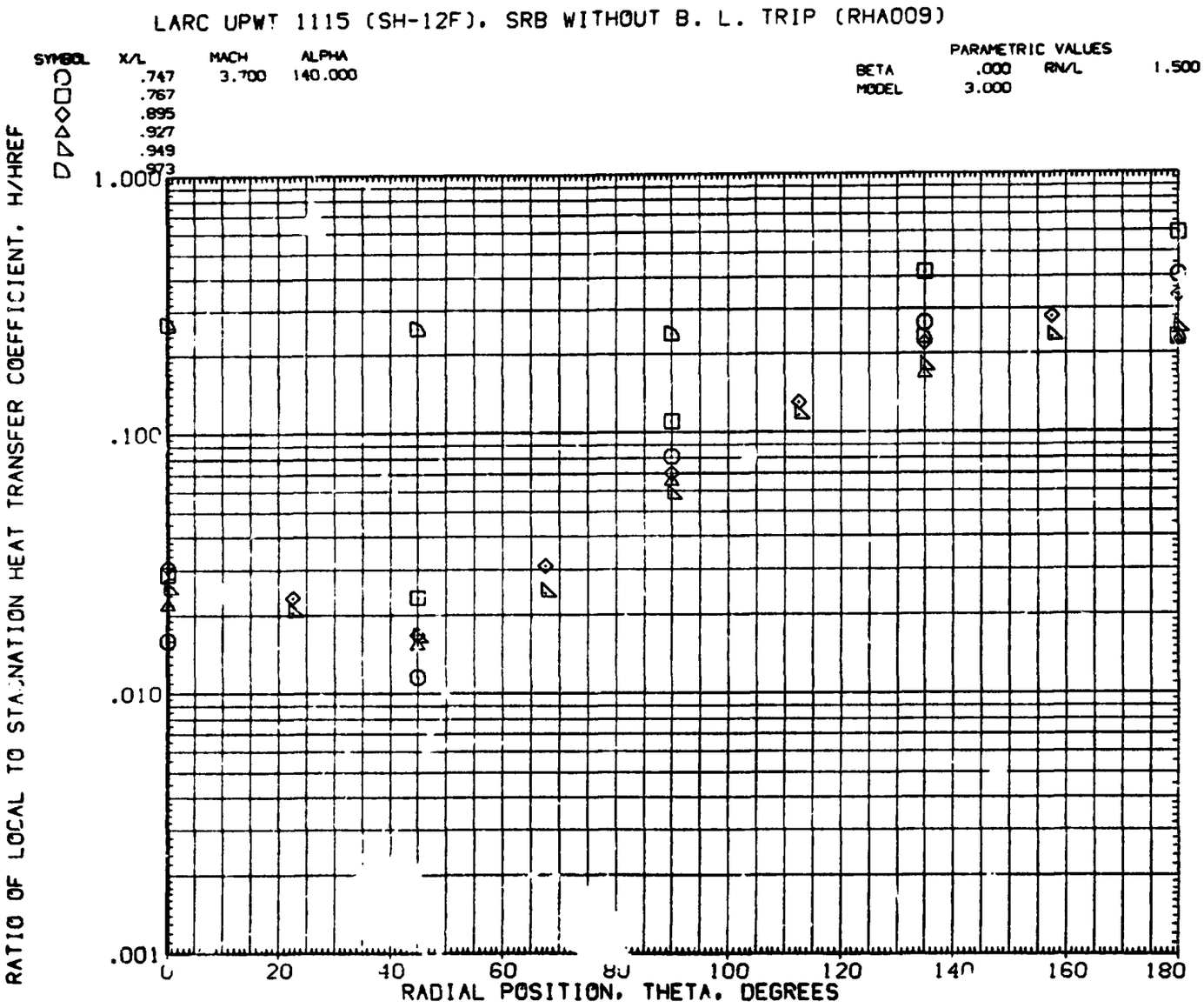
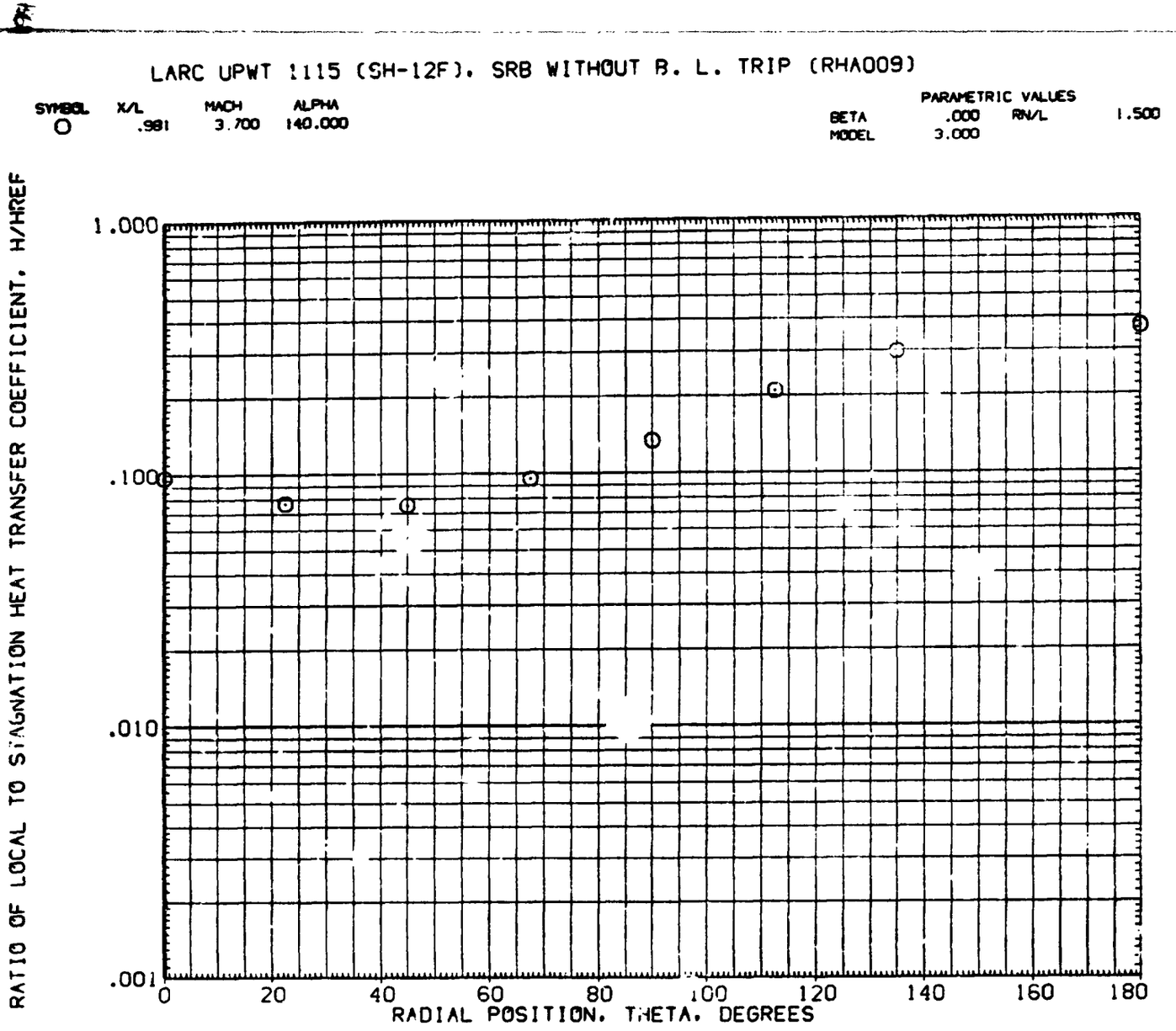


FIGURE 9 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=1.5)



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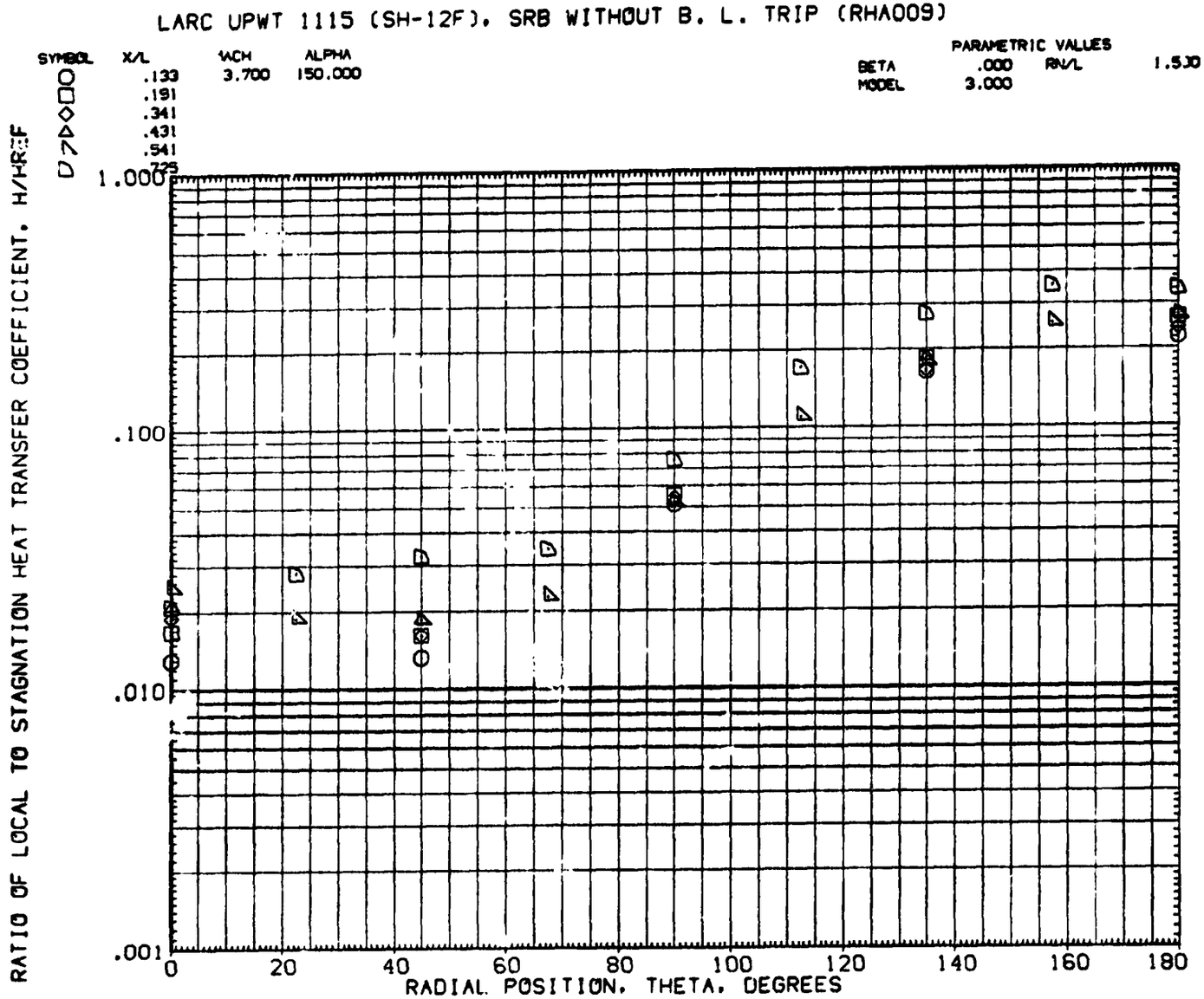

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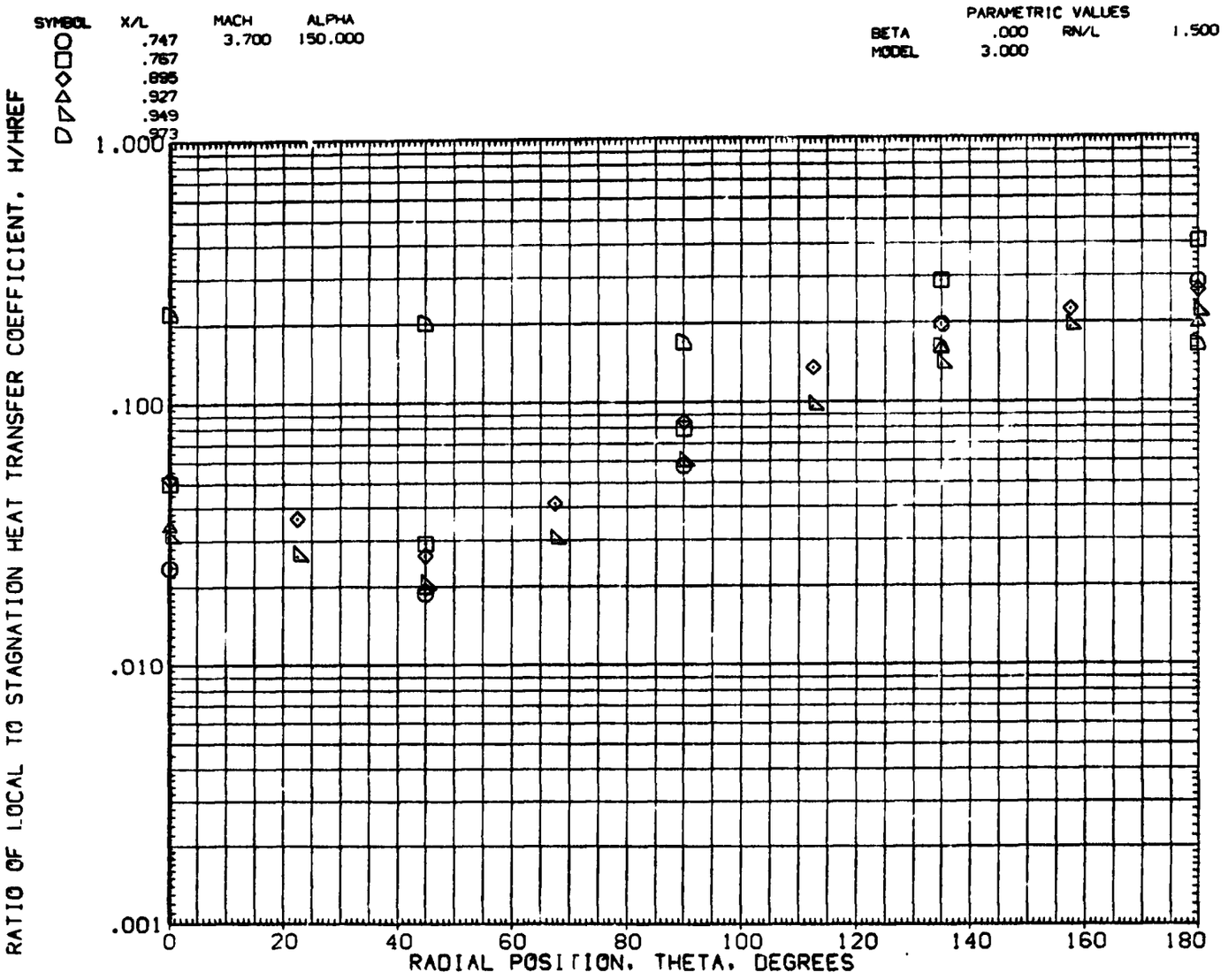

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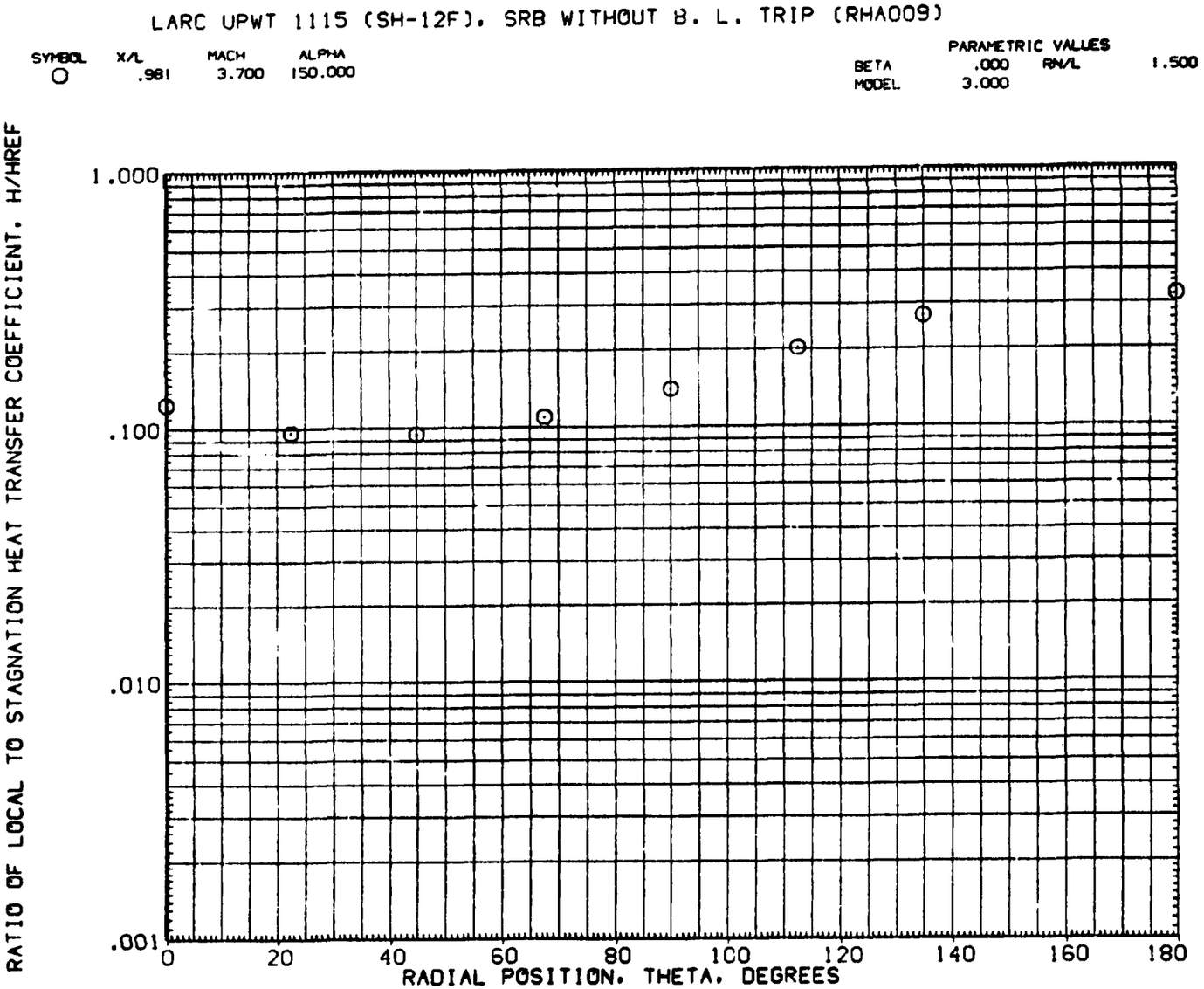

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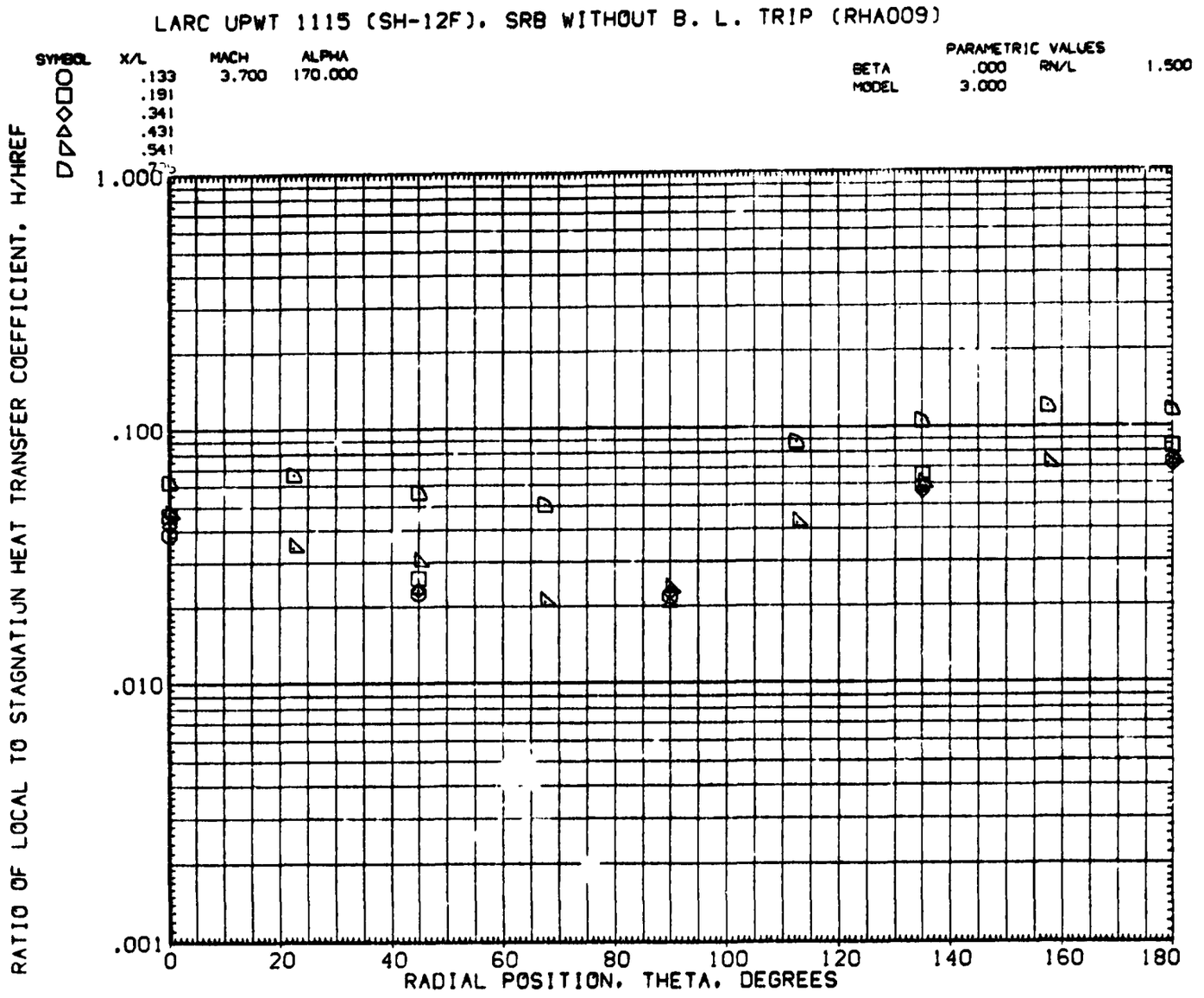

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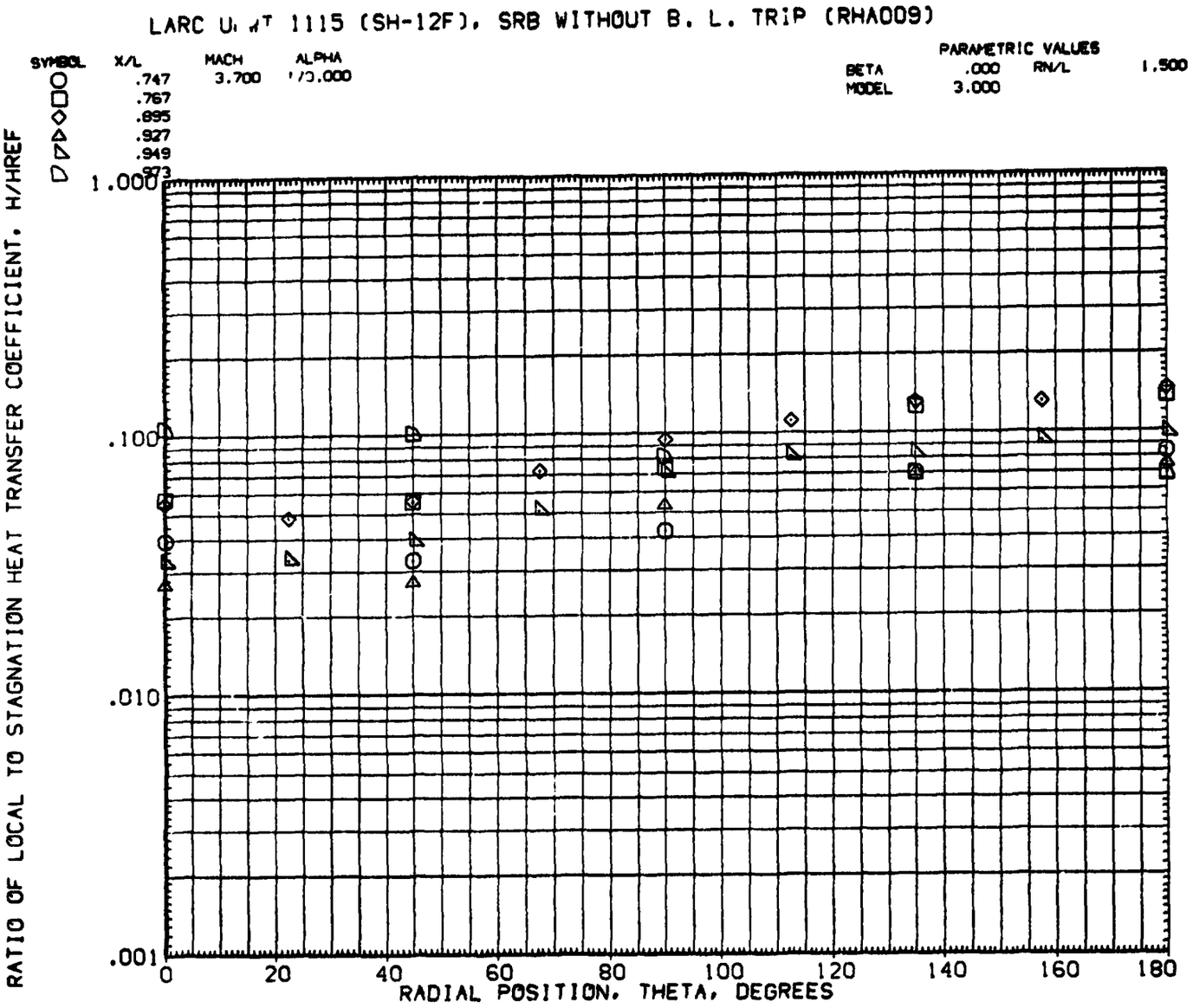

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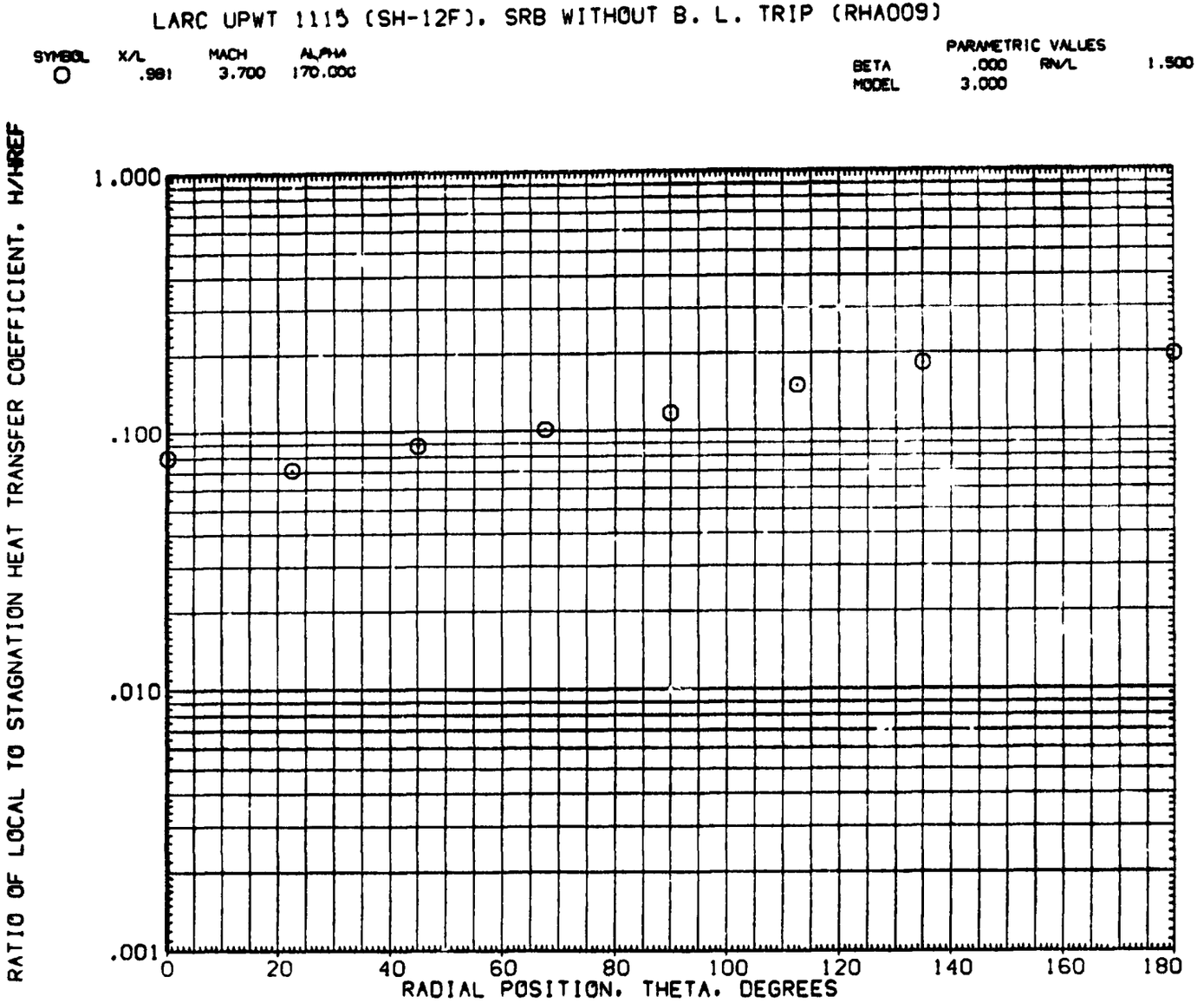

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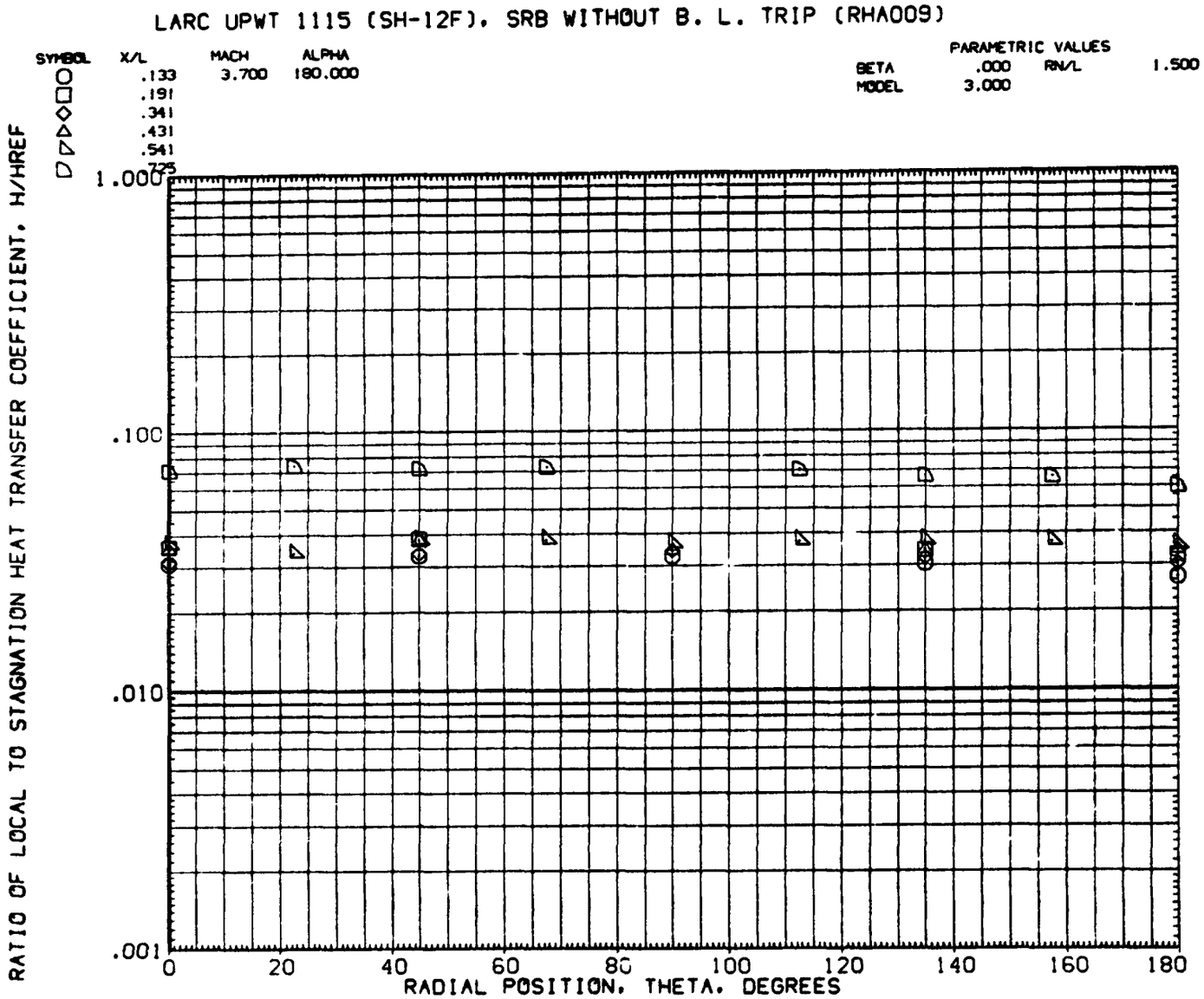

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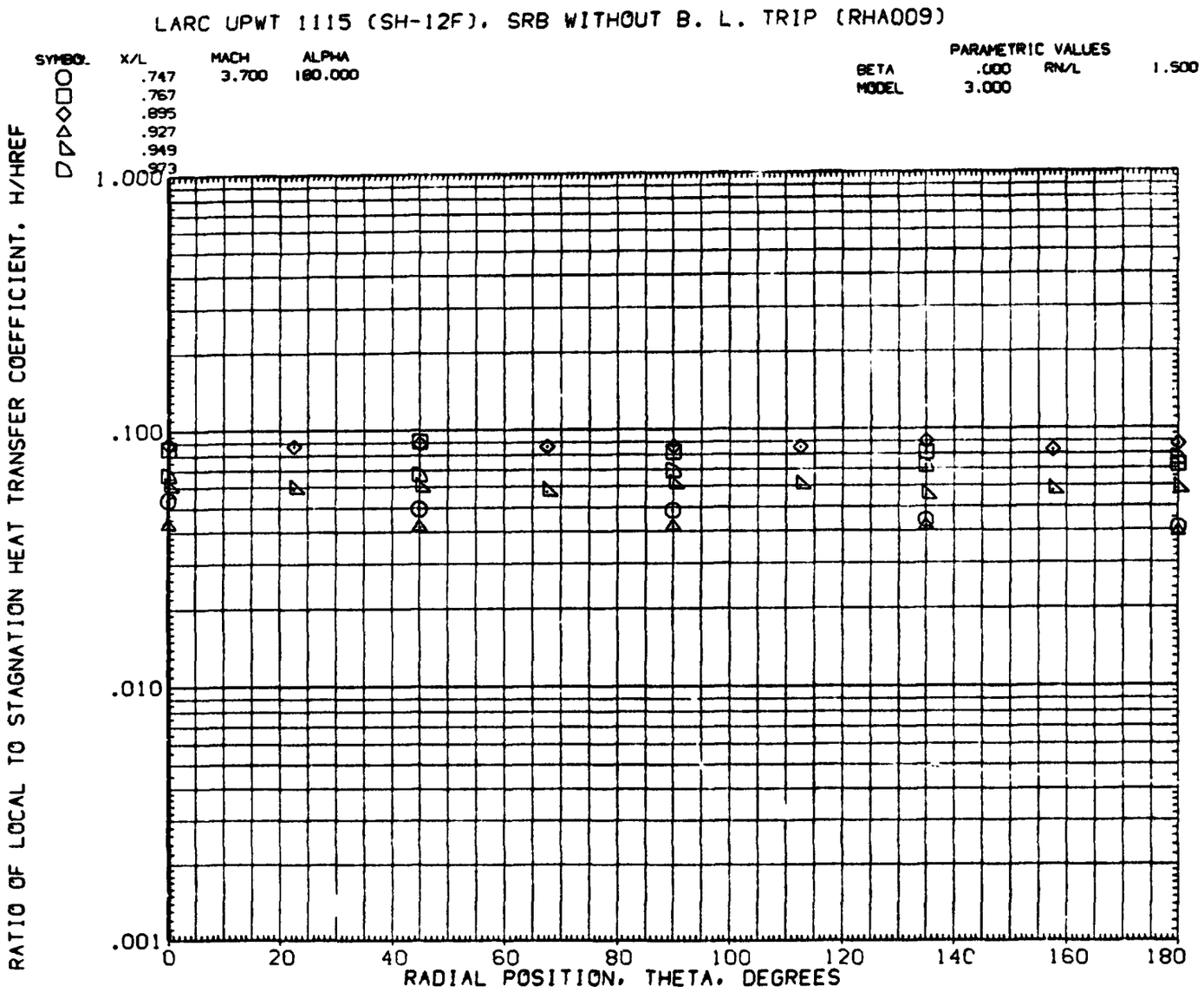

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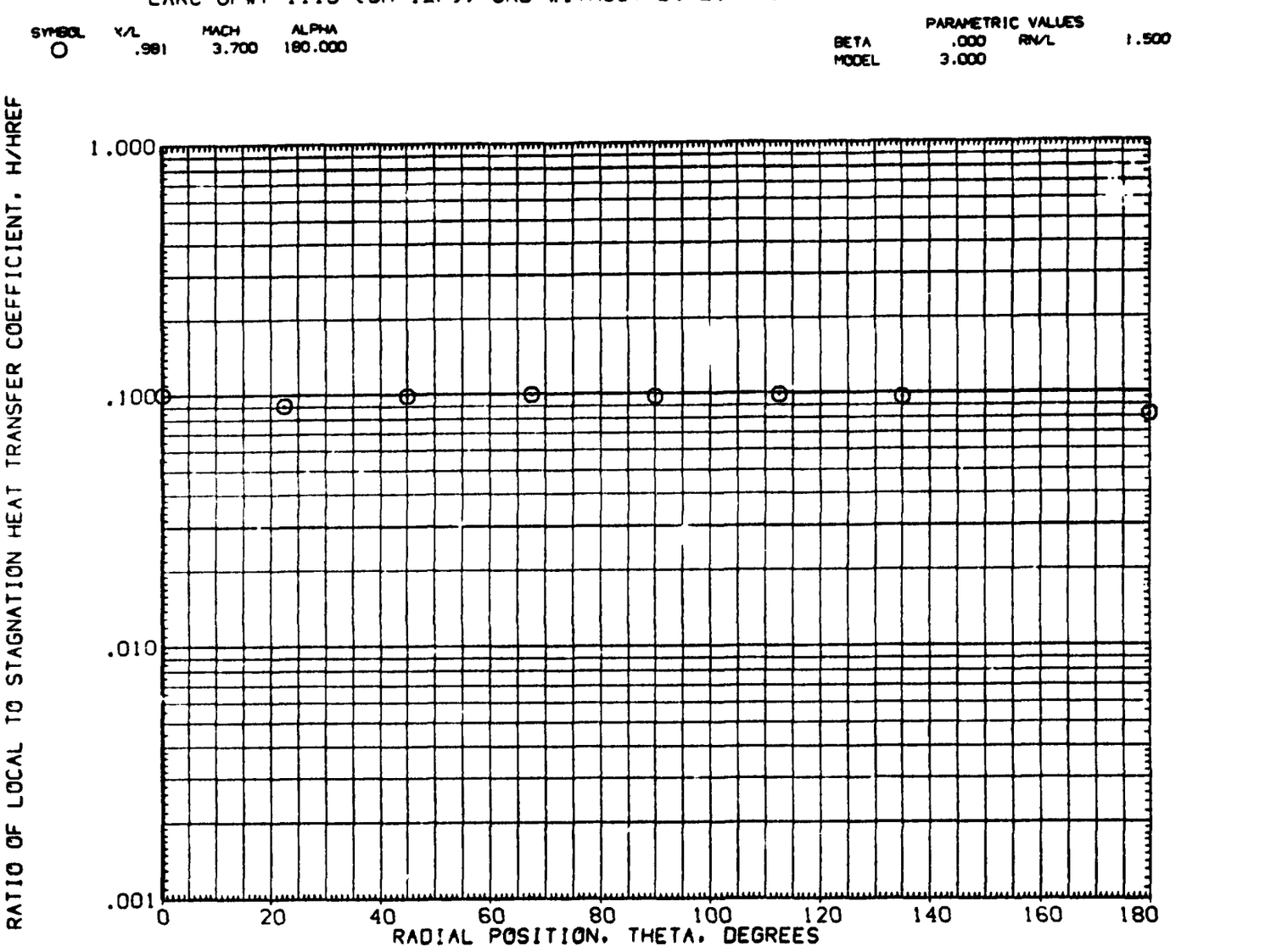

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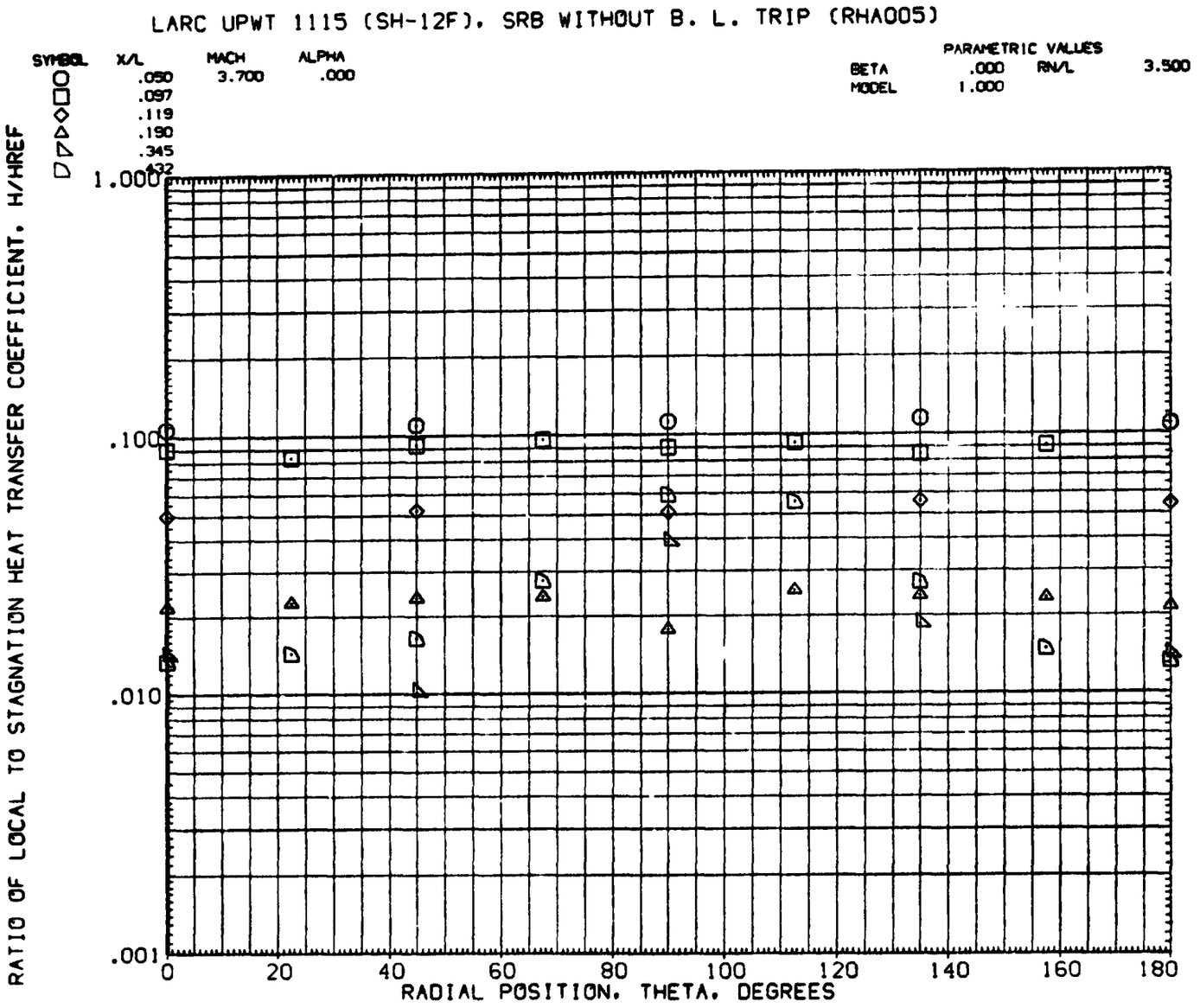


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

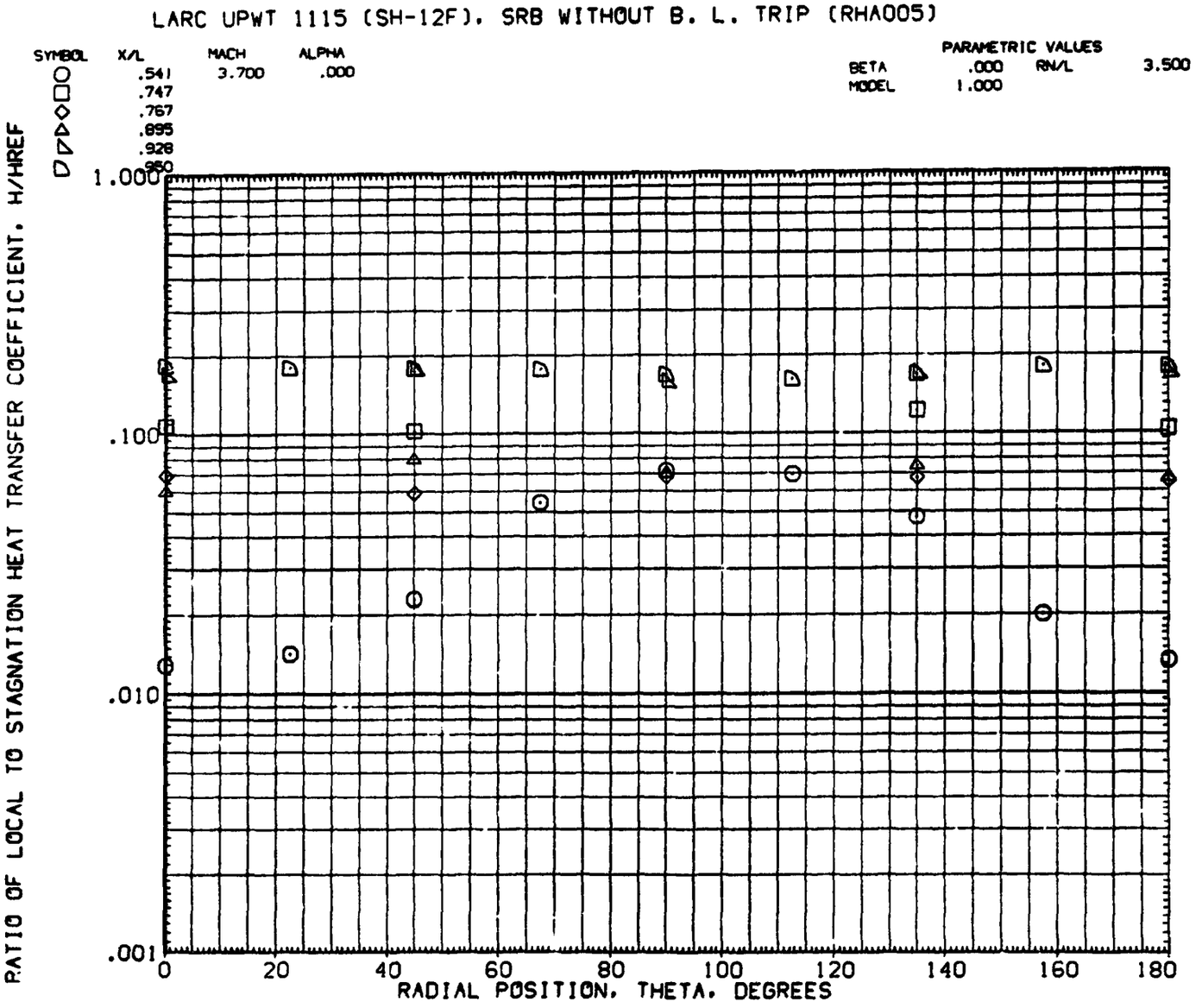
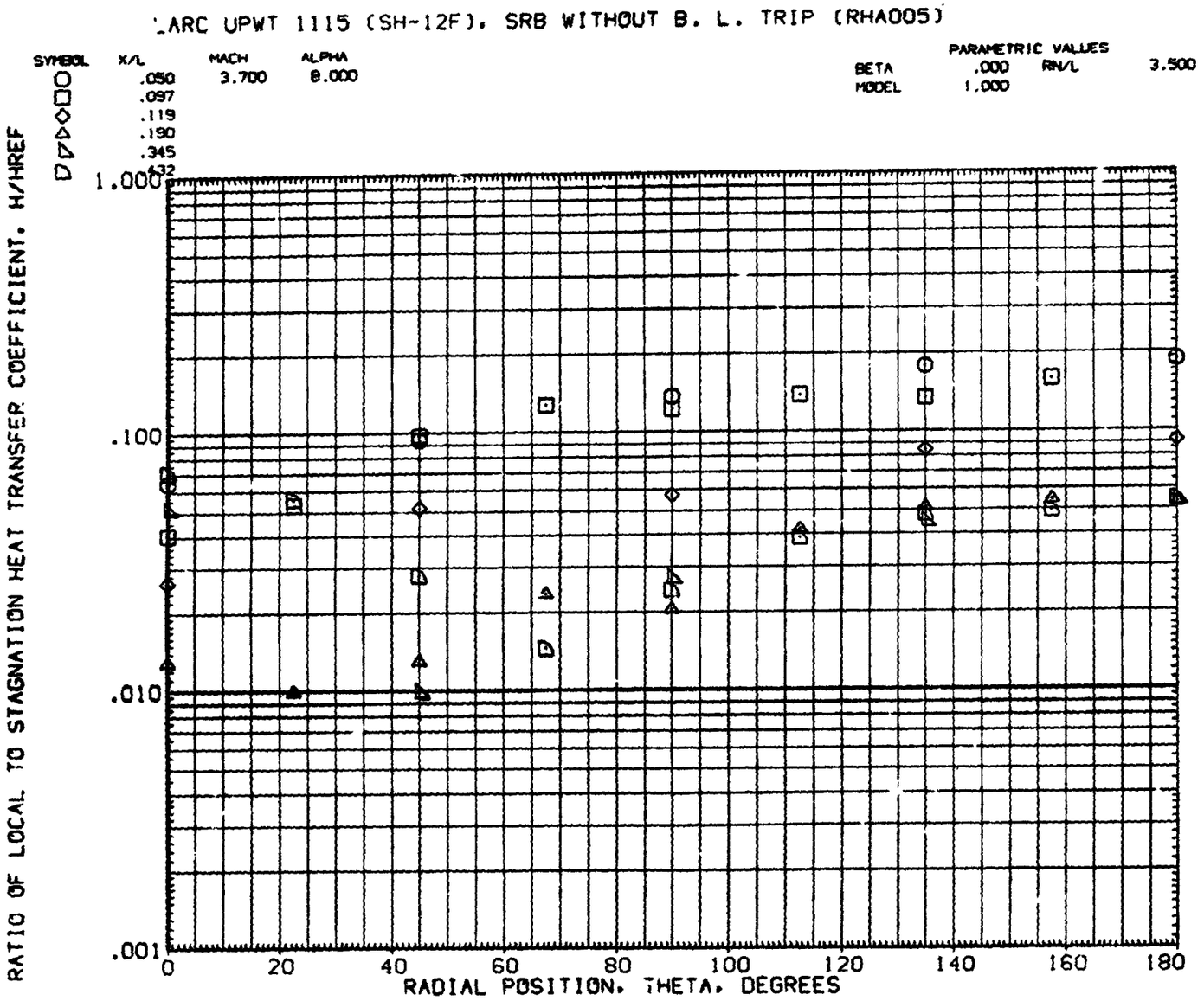


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)



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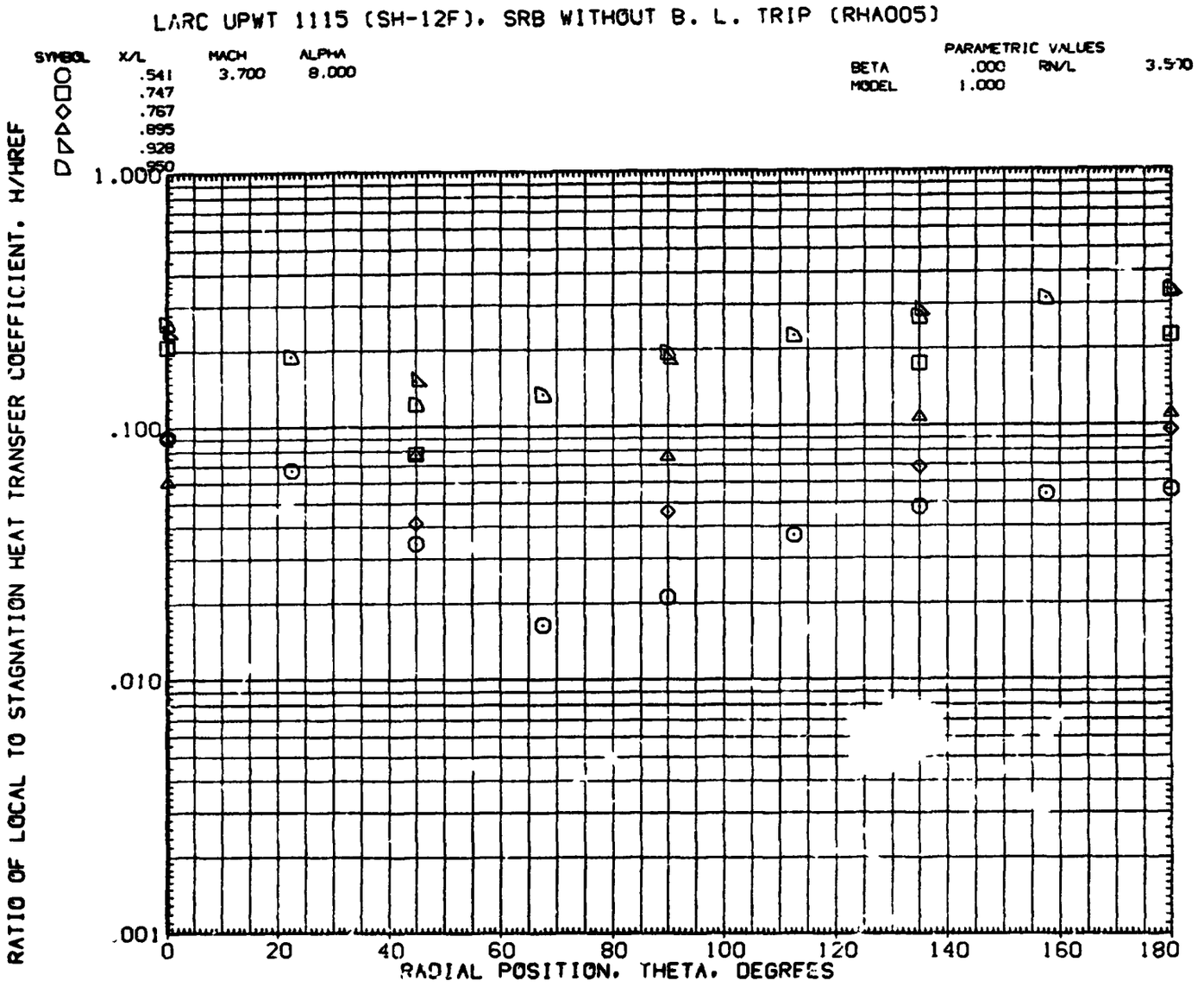

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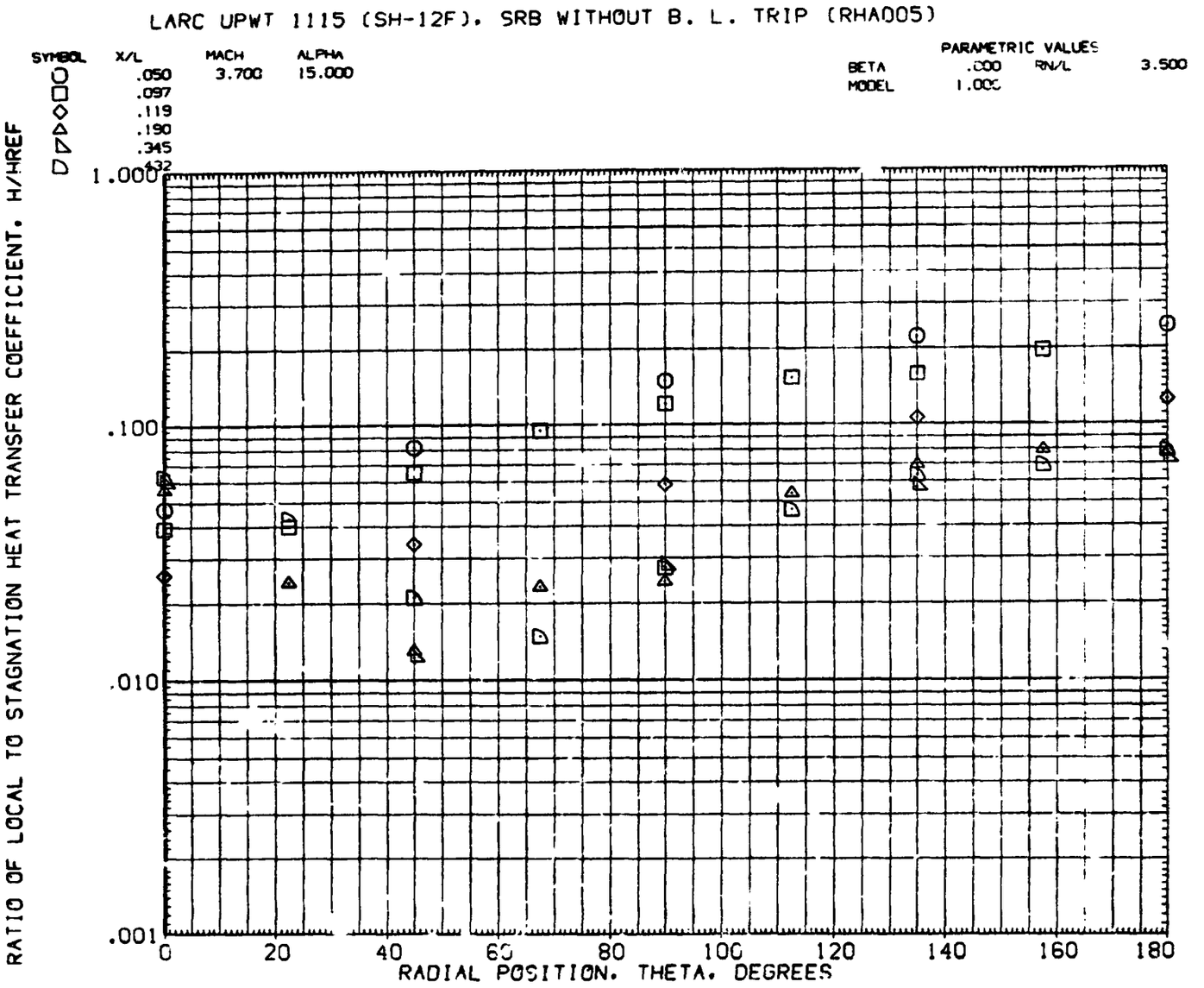

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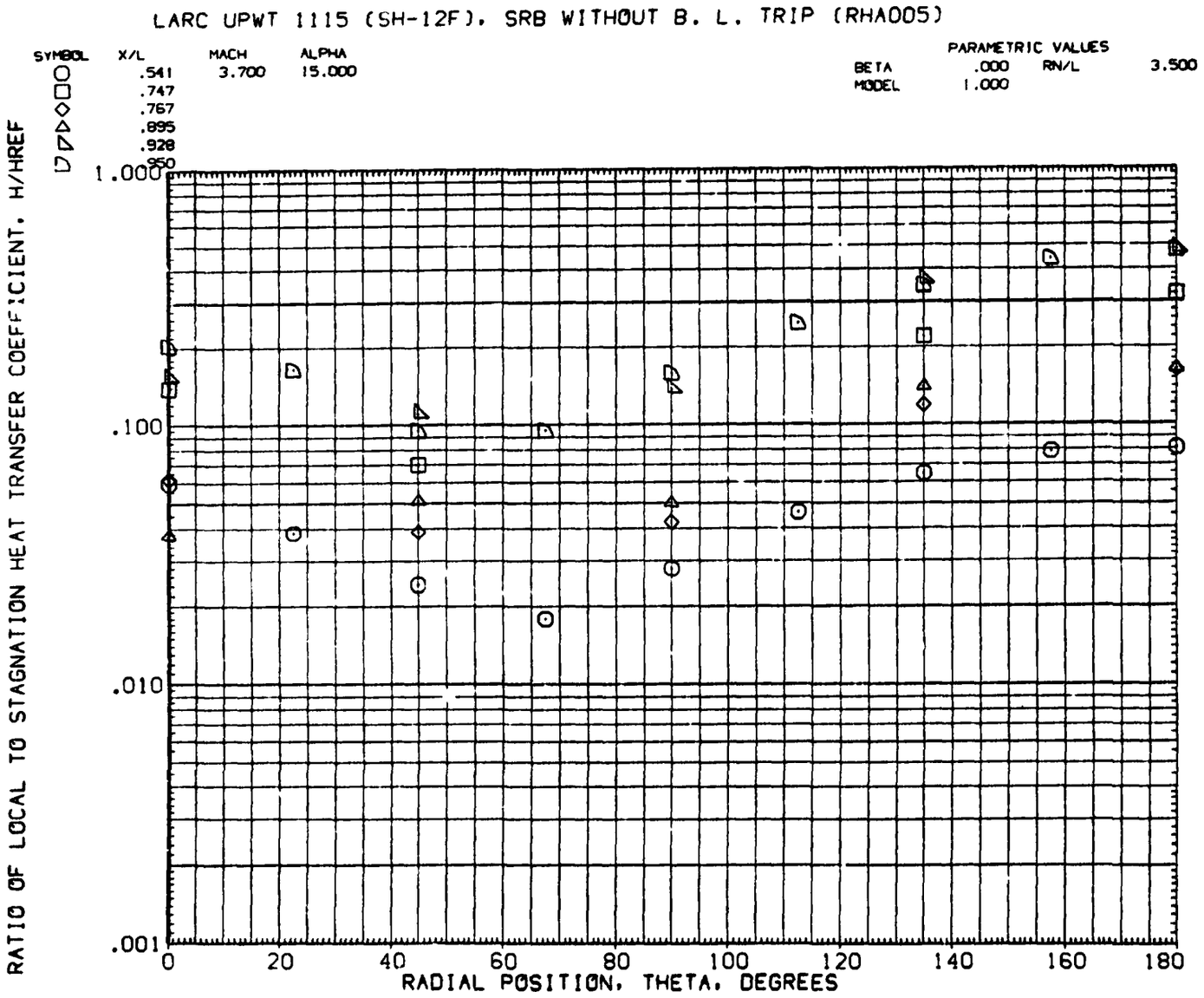

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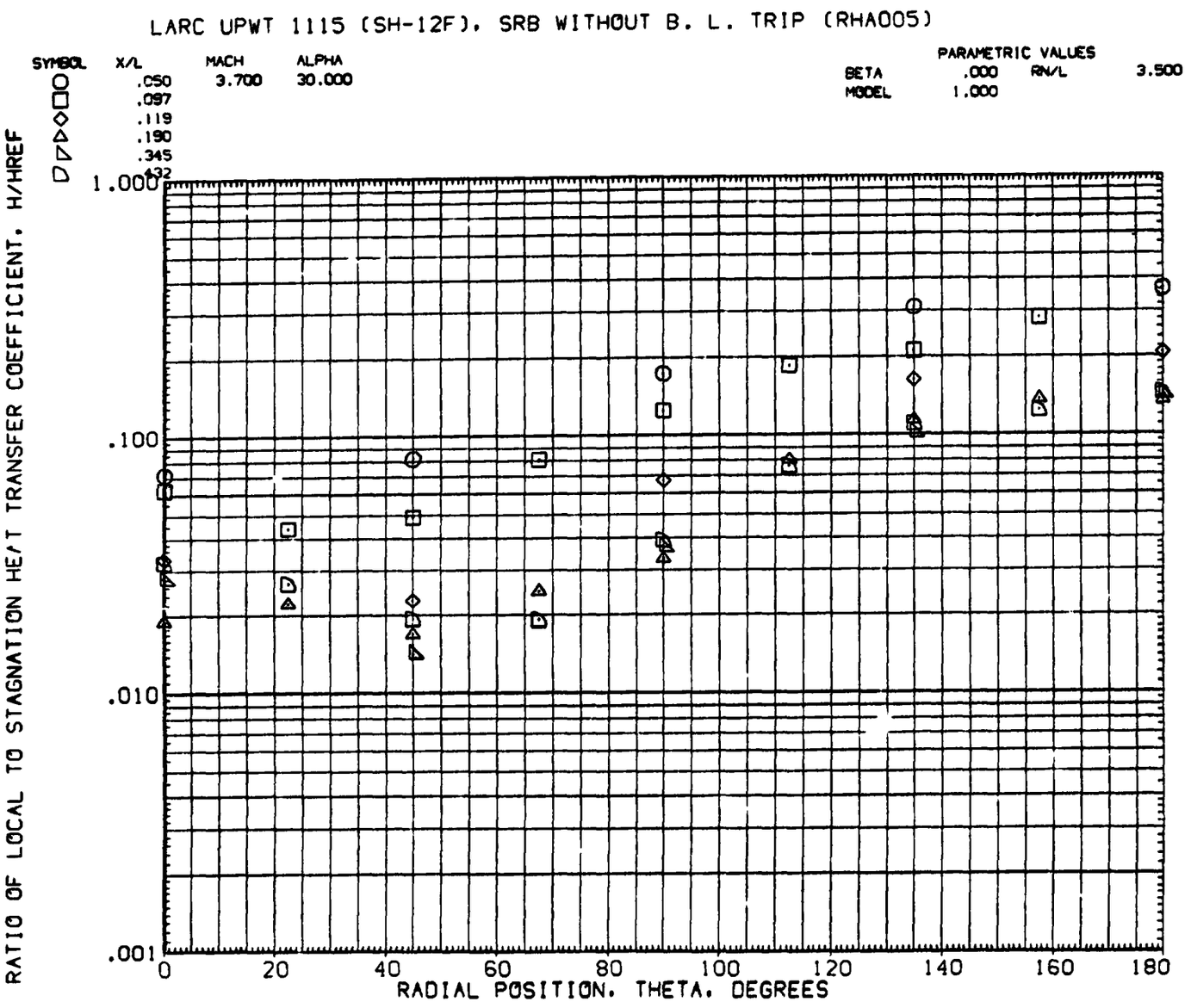

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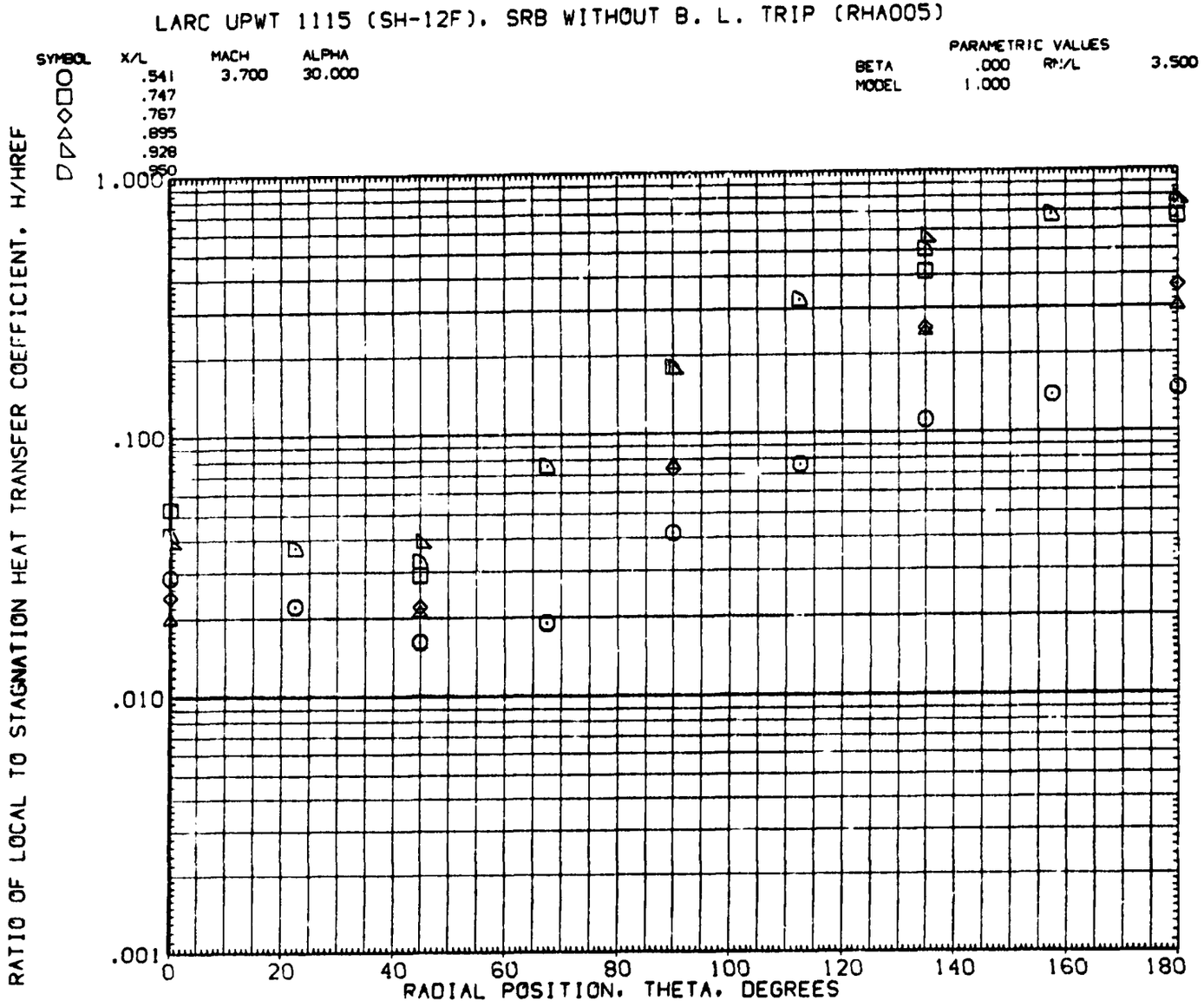

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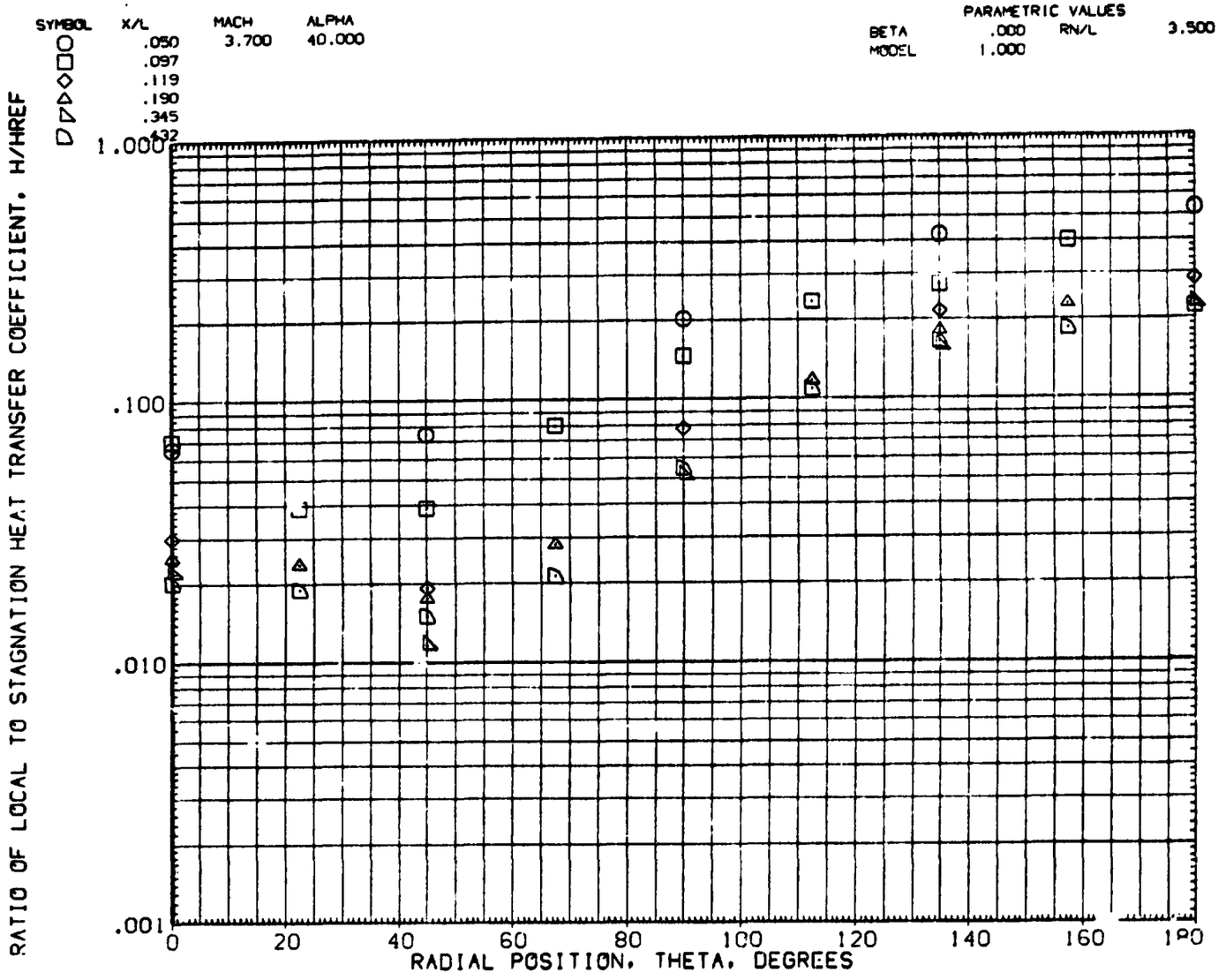

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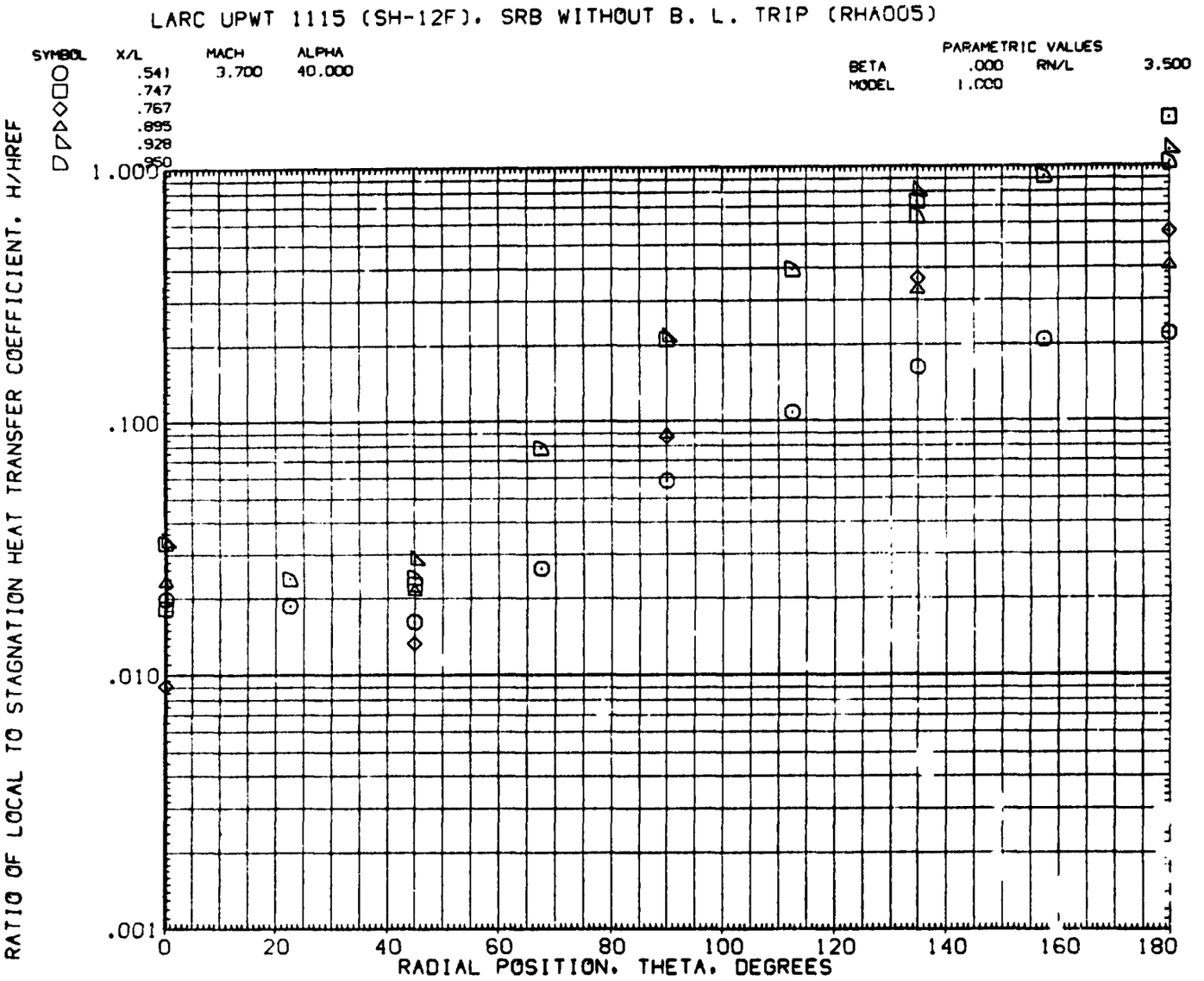

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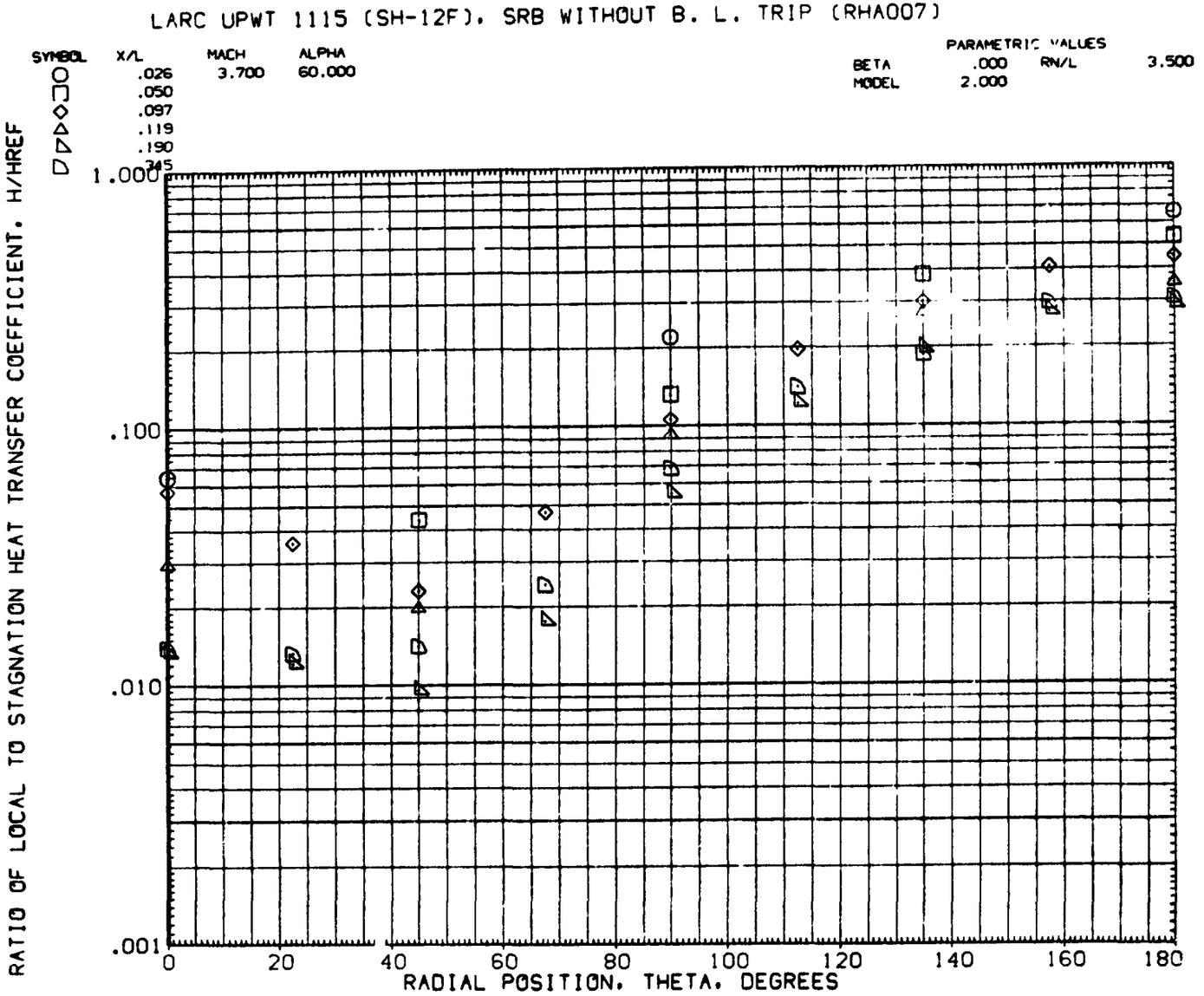

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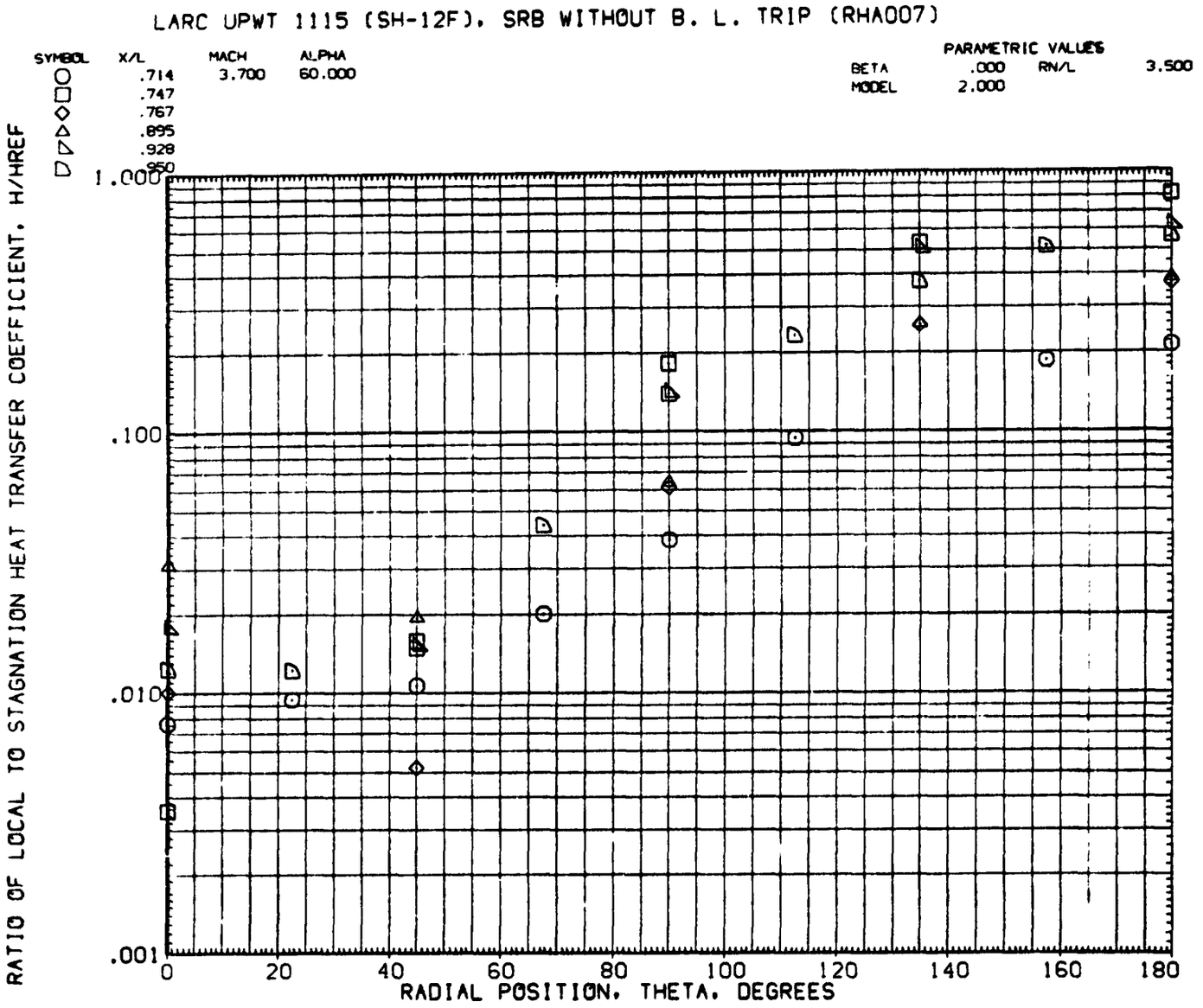

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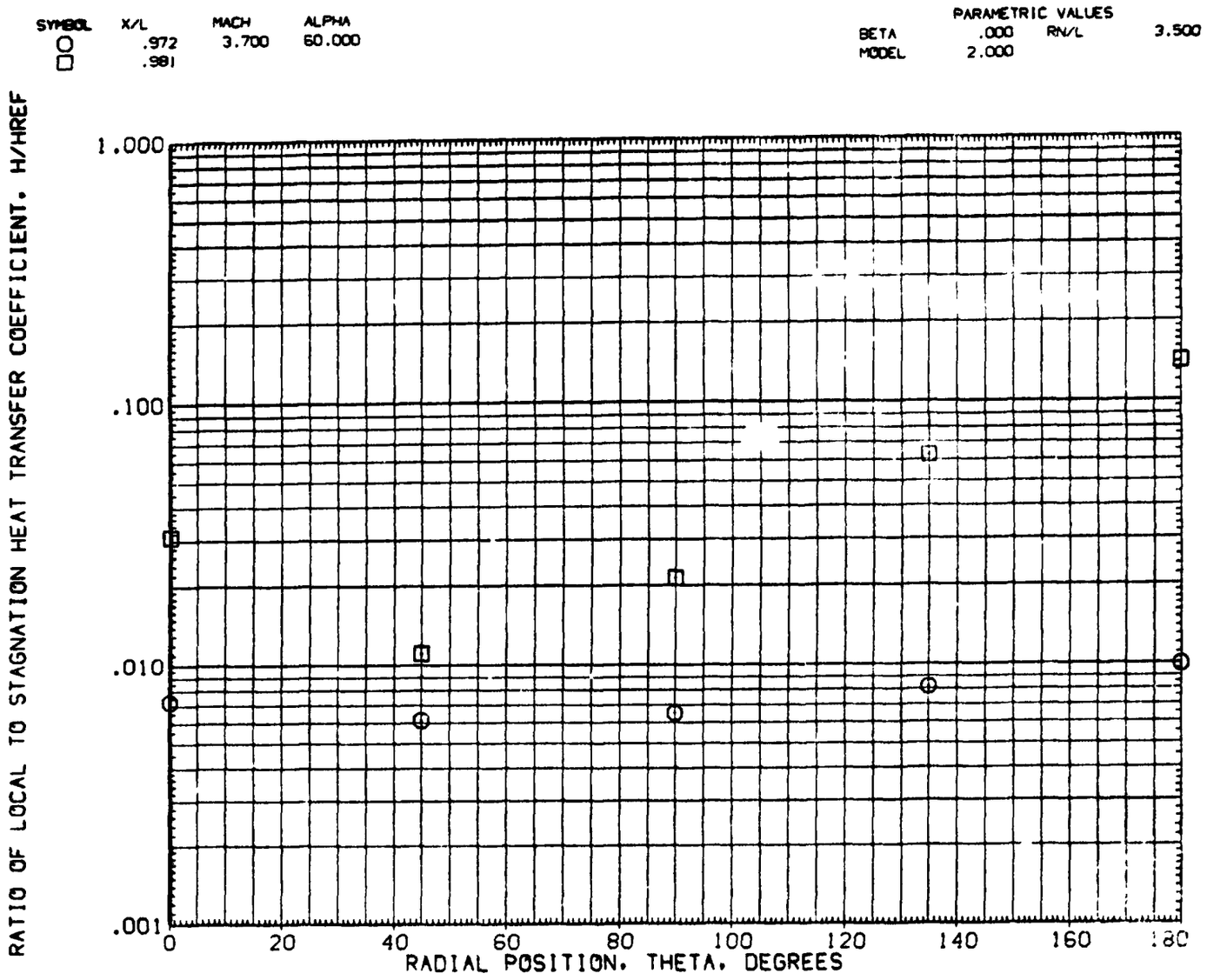

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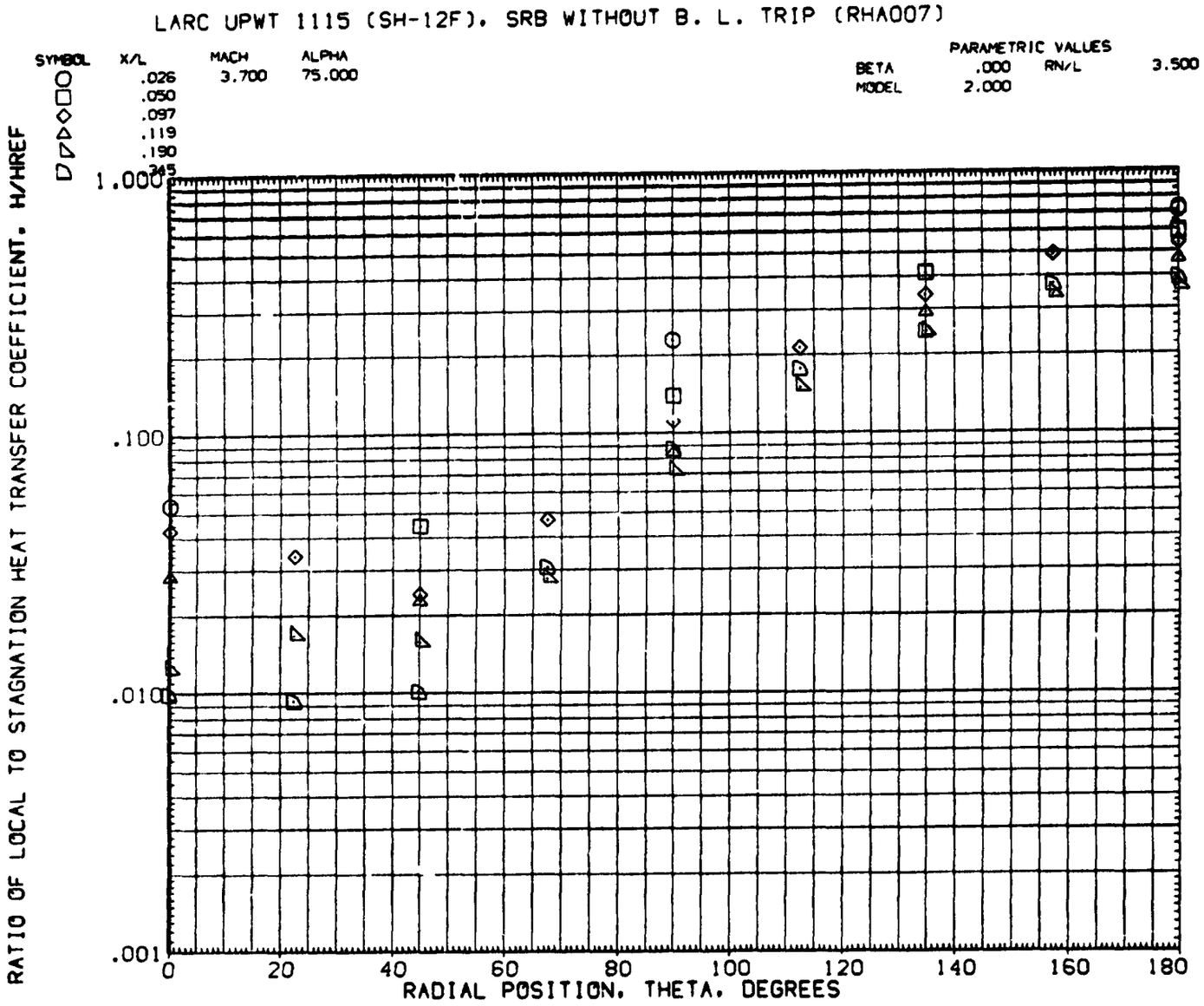

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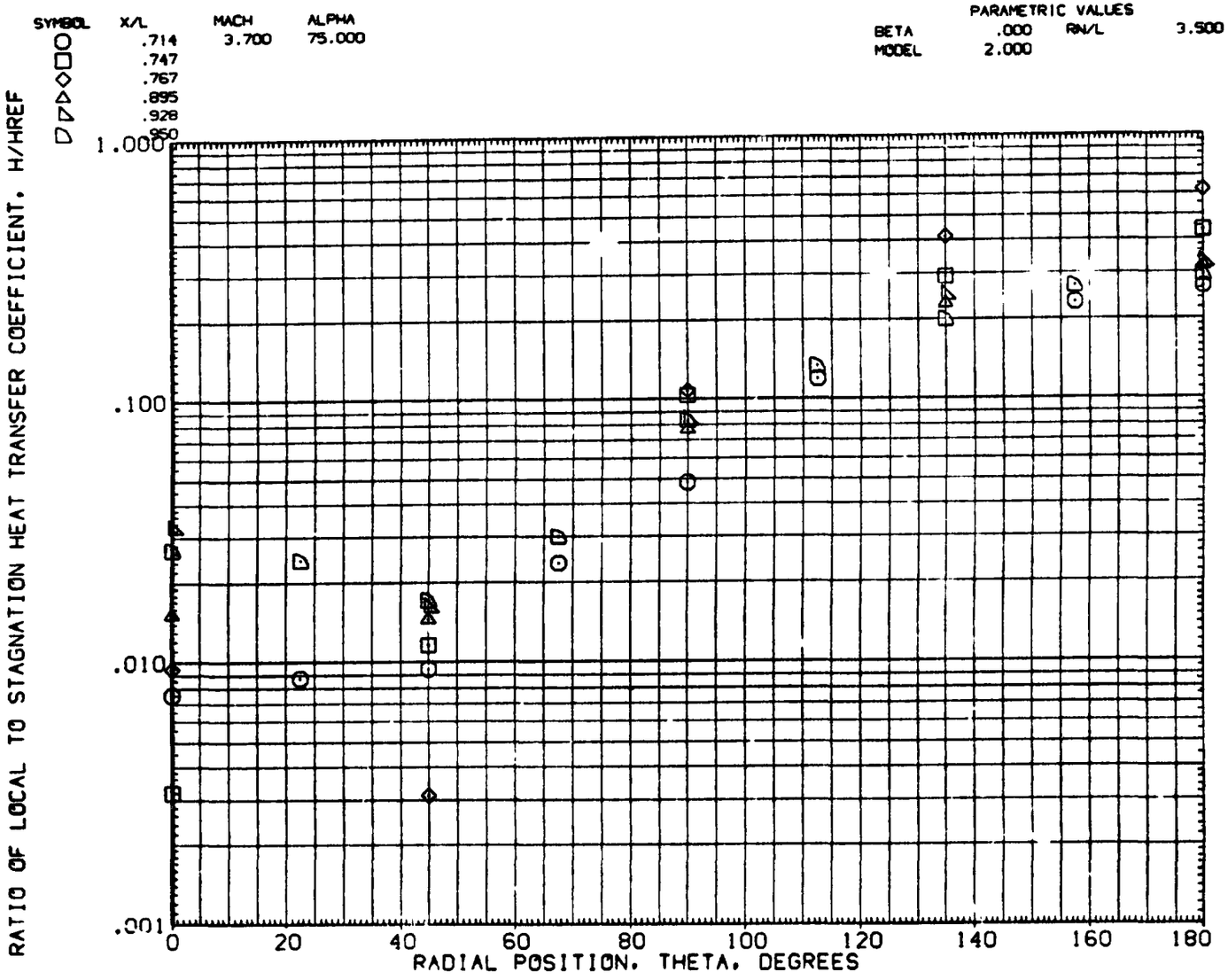

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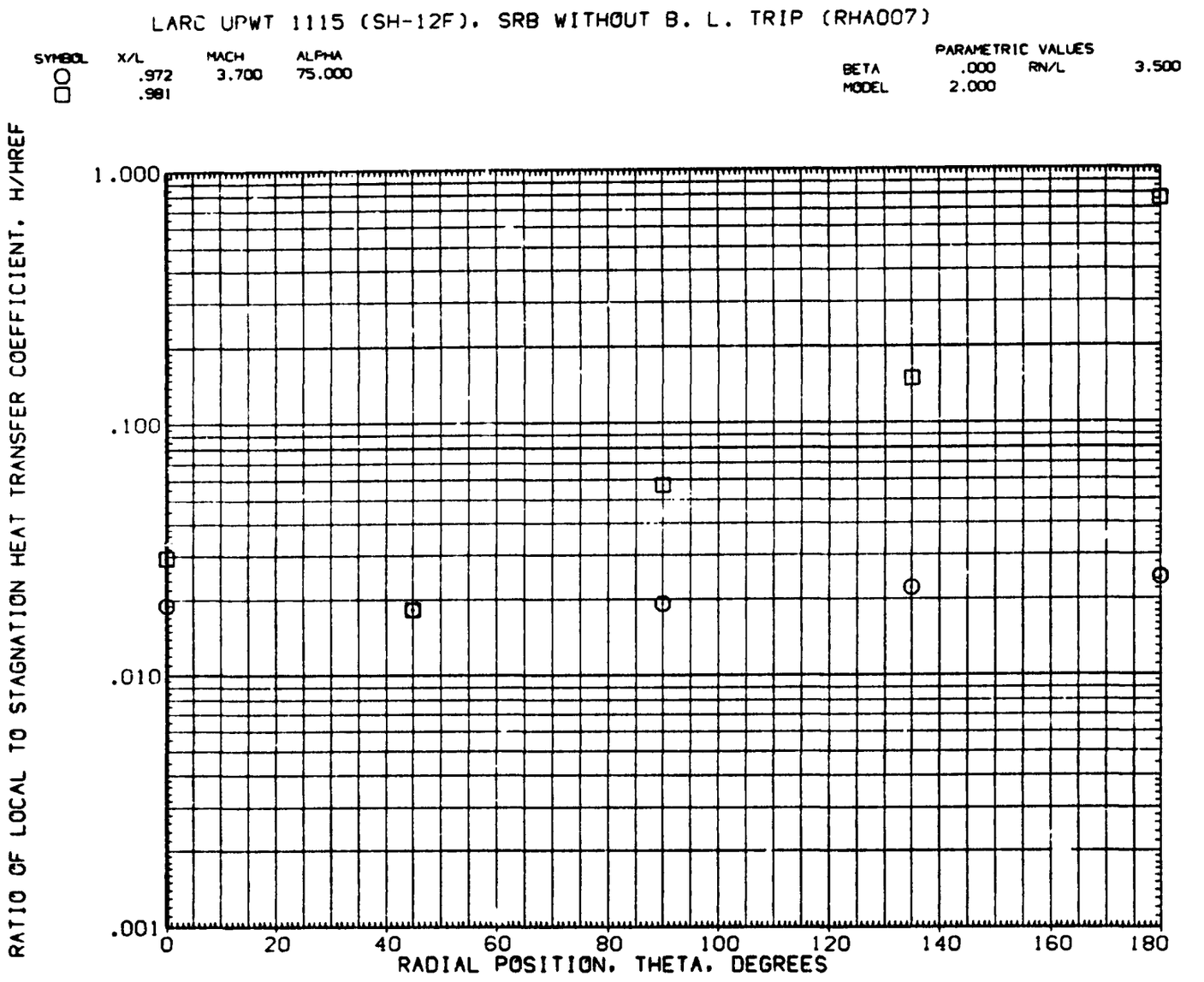

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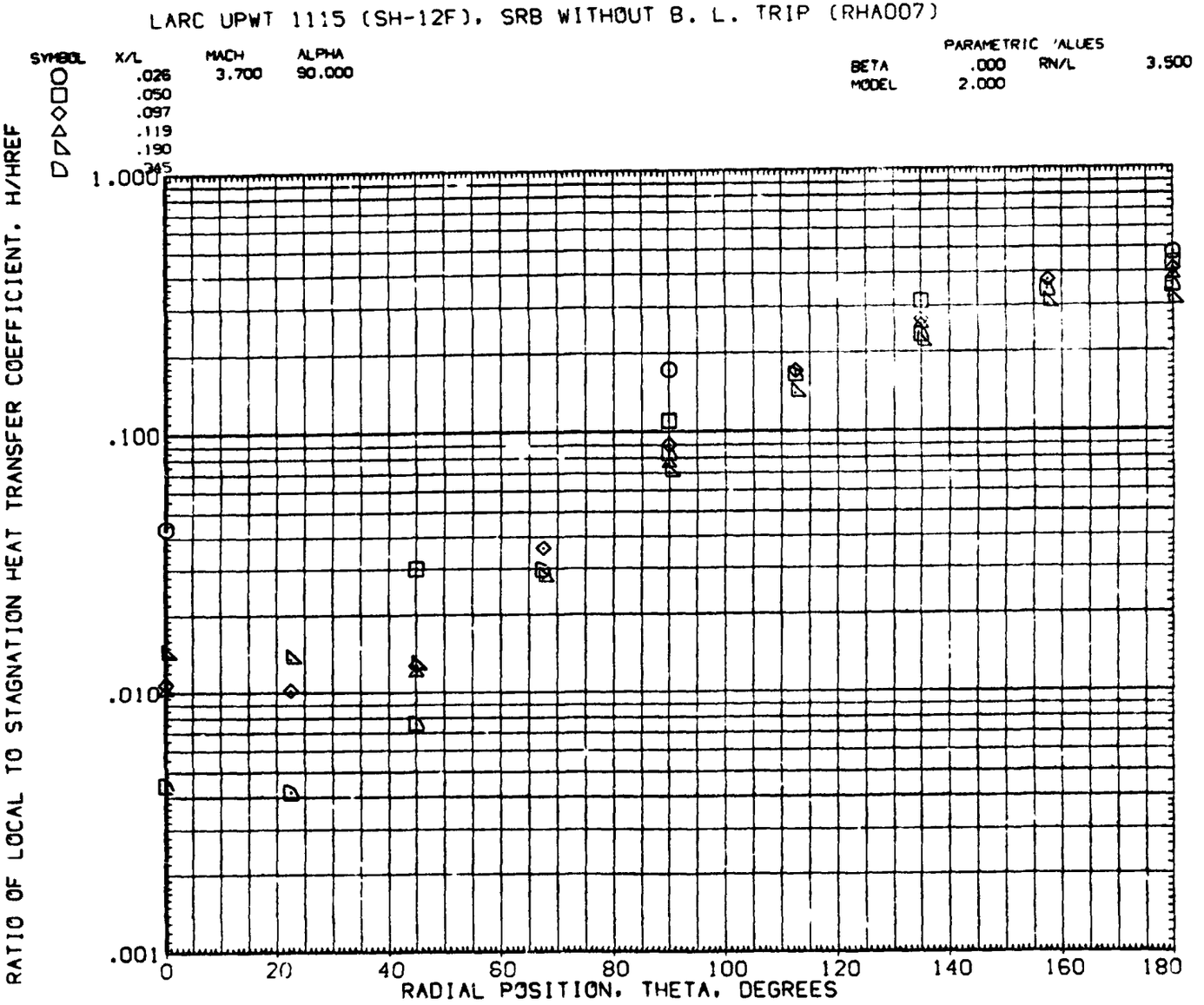


FIGURE 10 H/HREF RADIALLY AT VARIOUS $\wedge$/L STATIONS(W/O BNDRY LAYER TRIP, RN/L=3.5)

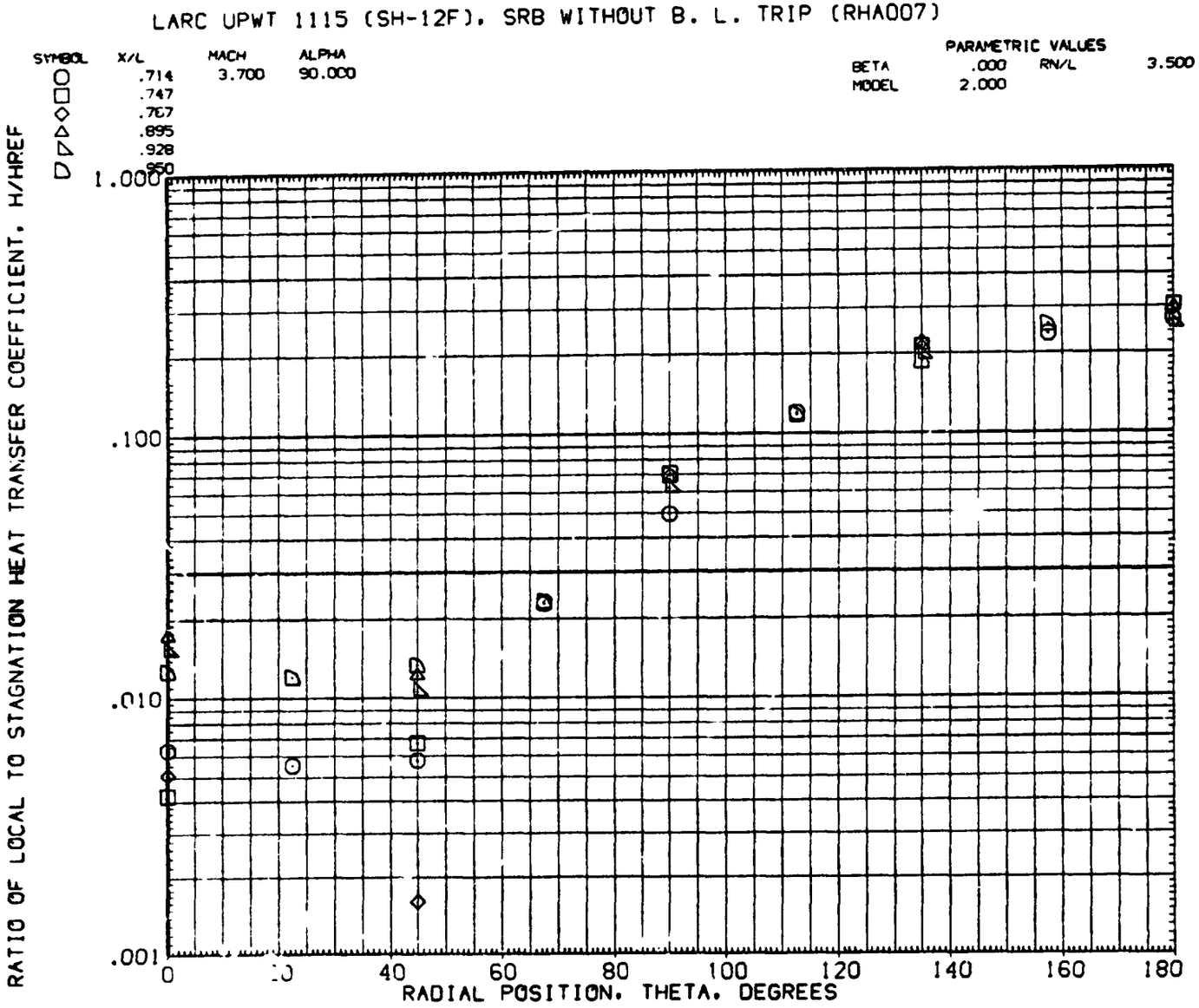


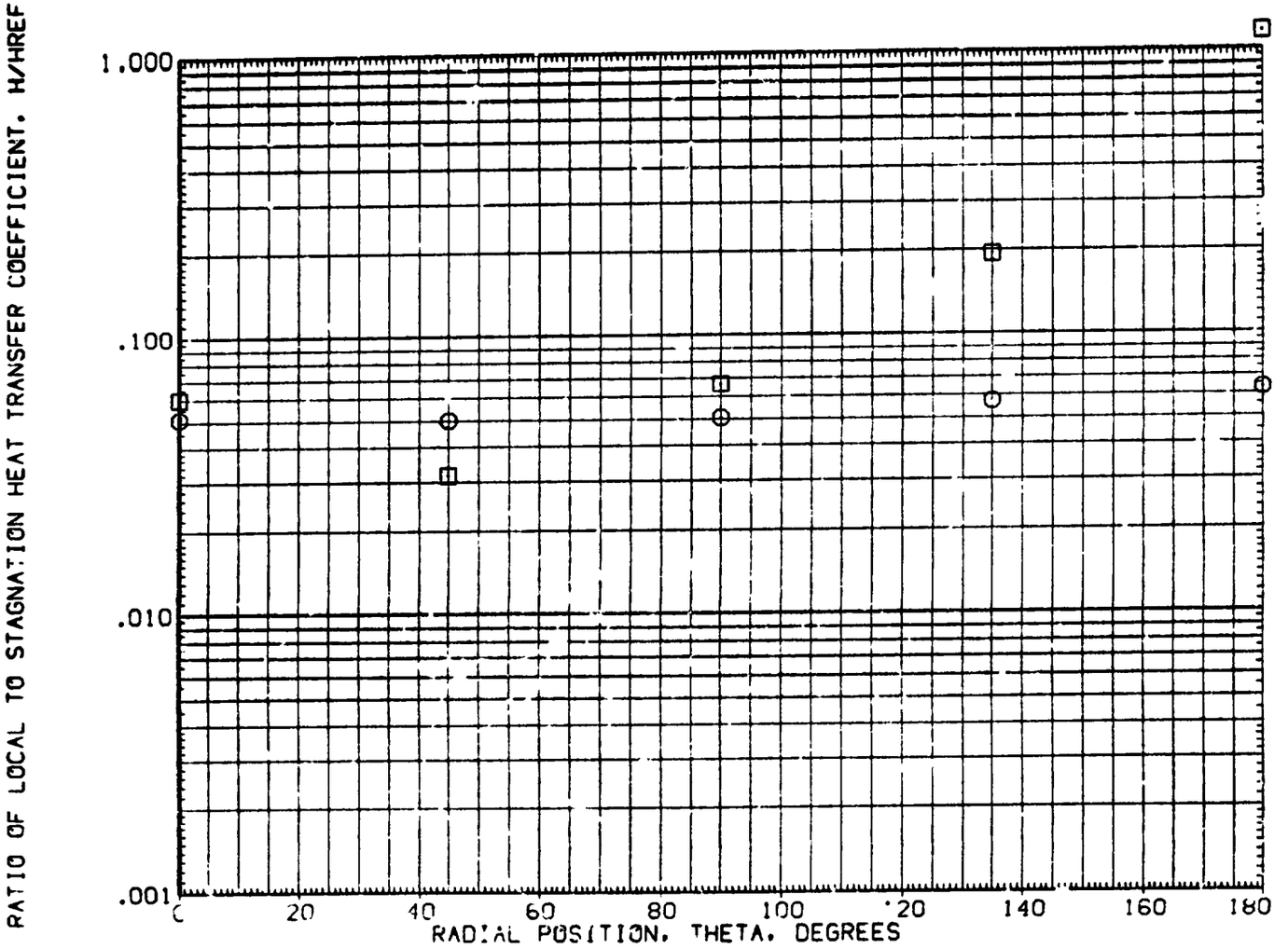
FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP, RN/L=3.5)

LARC UPWT 1115 (SH-12F). SRB WITHOUT B. L. TRIP (RHA007)

SYMBOL	X/L	MACH	ALPHA
○	.972	3.700	30.000
□	.981		

PARAMETRIC VALUES

BETA	.000	RN/L	3.500
MODEL	2.000		



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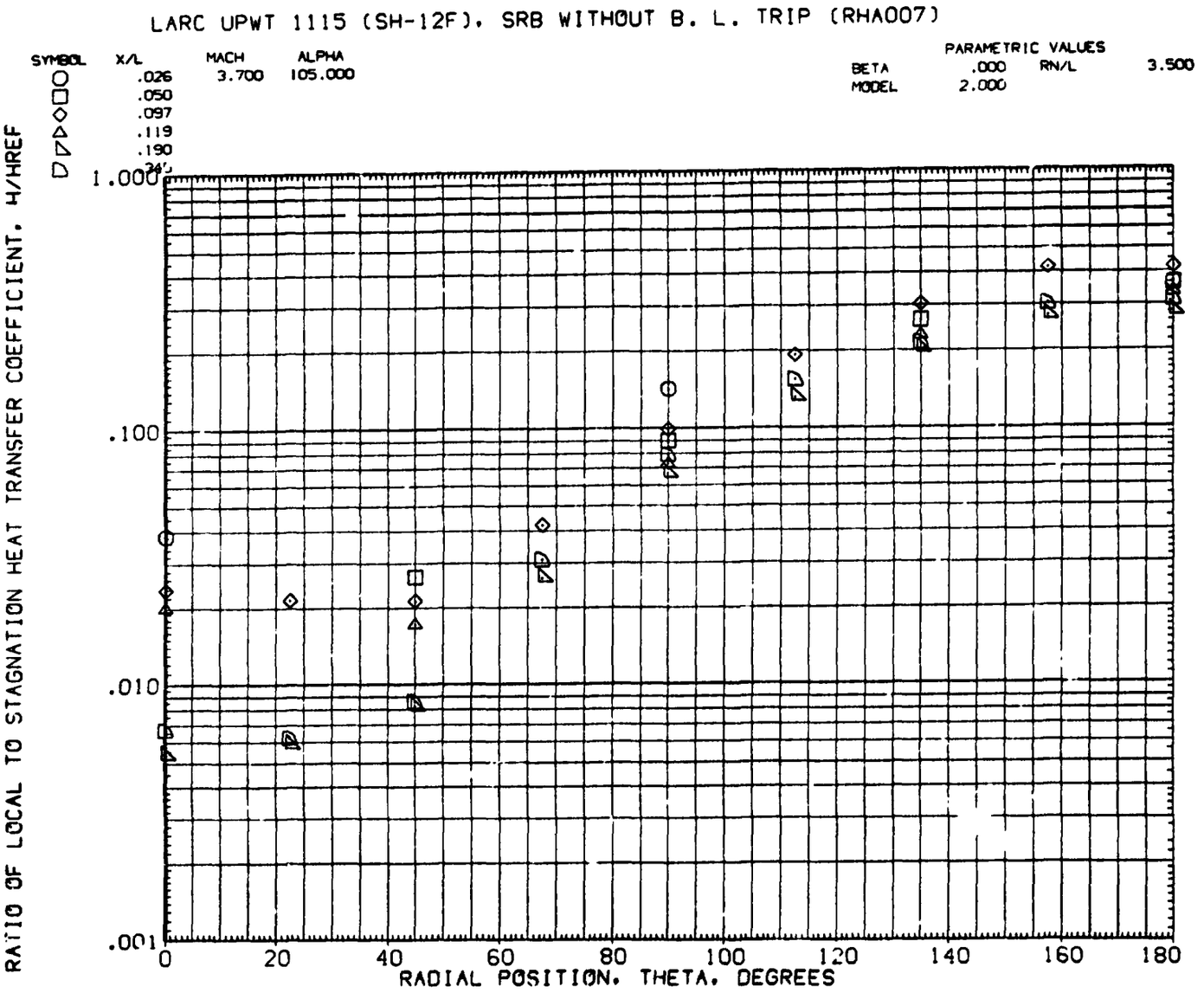

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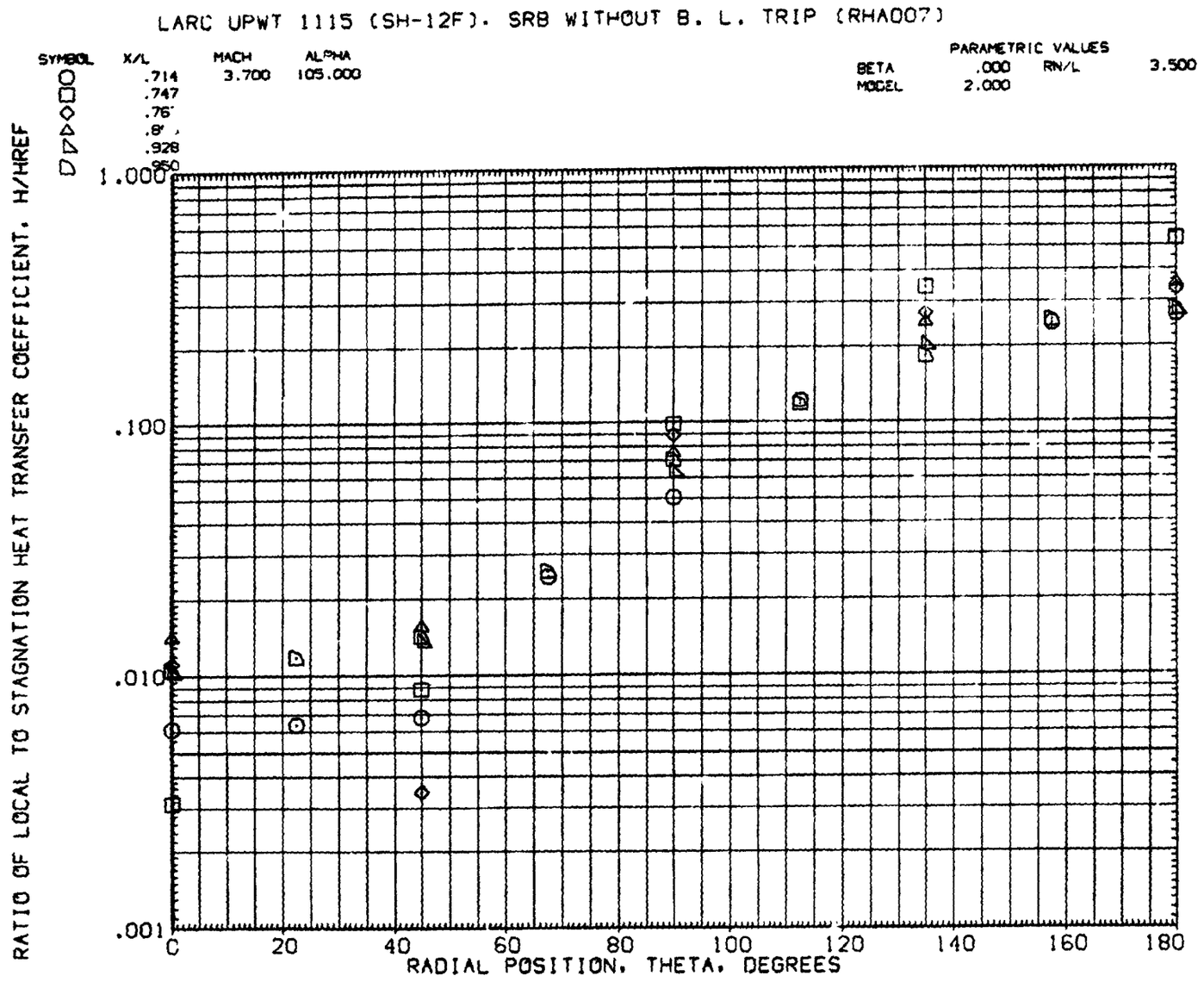

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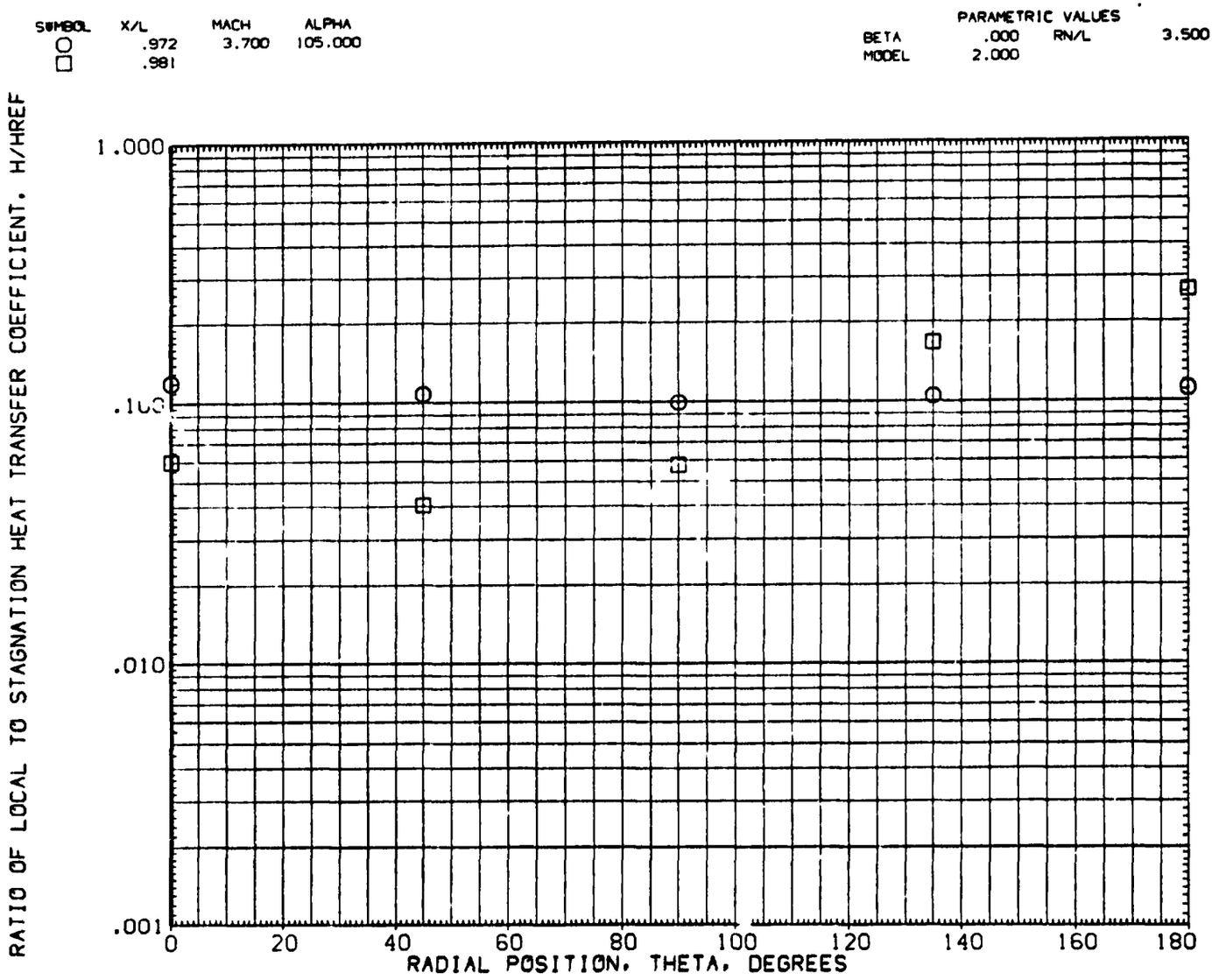


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

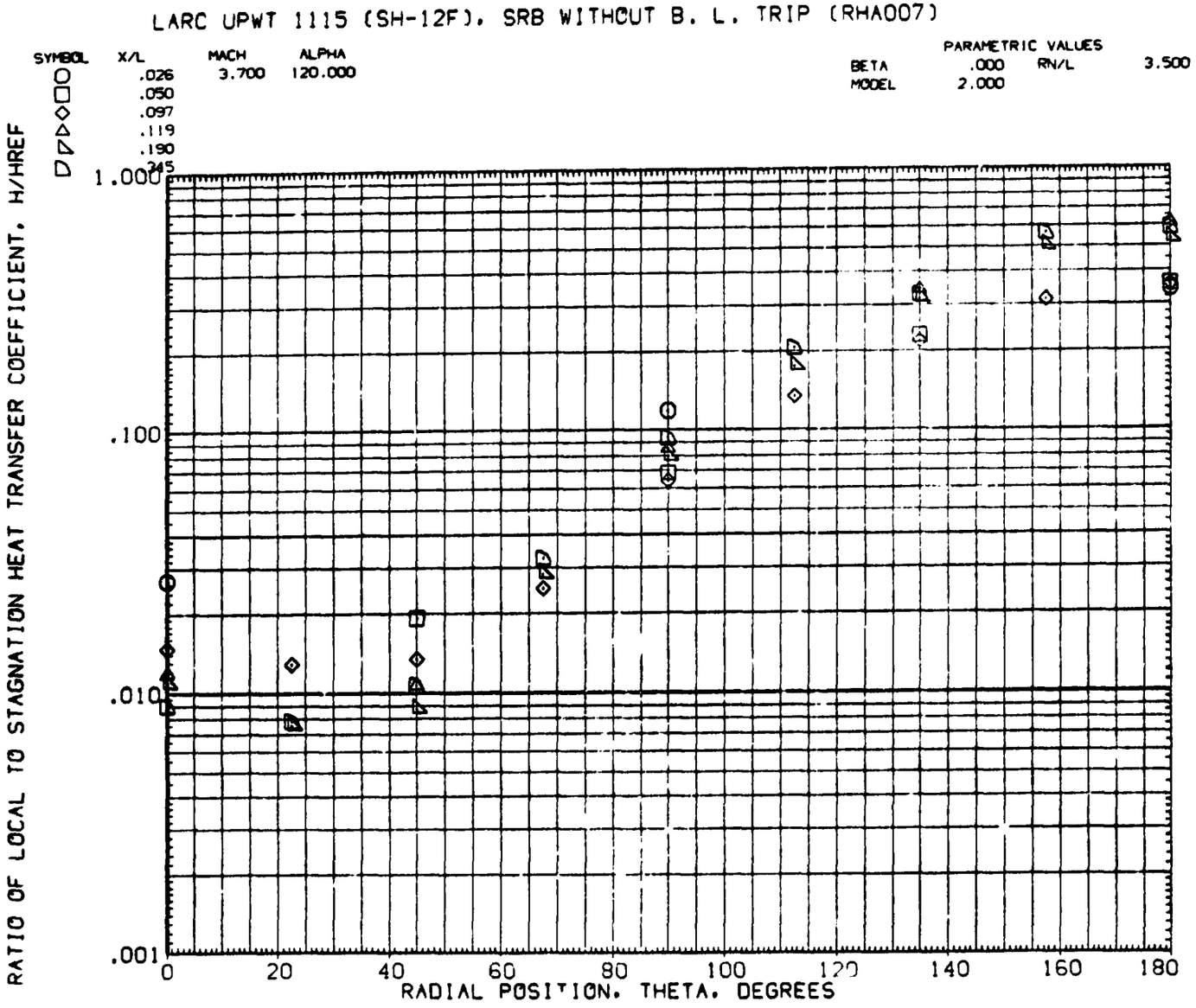


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

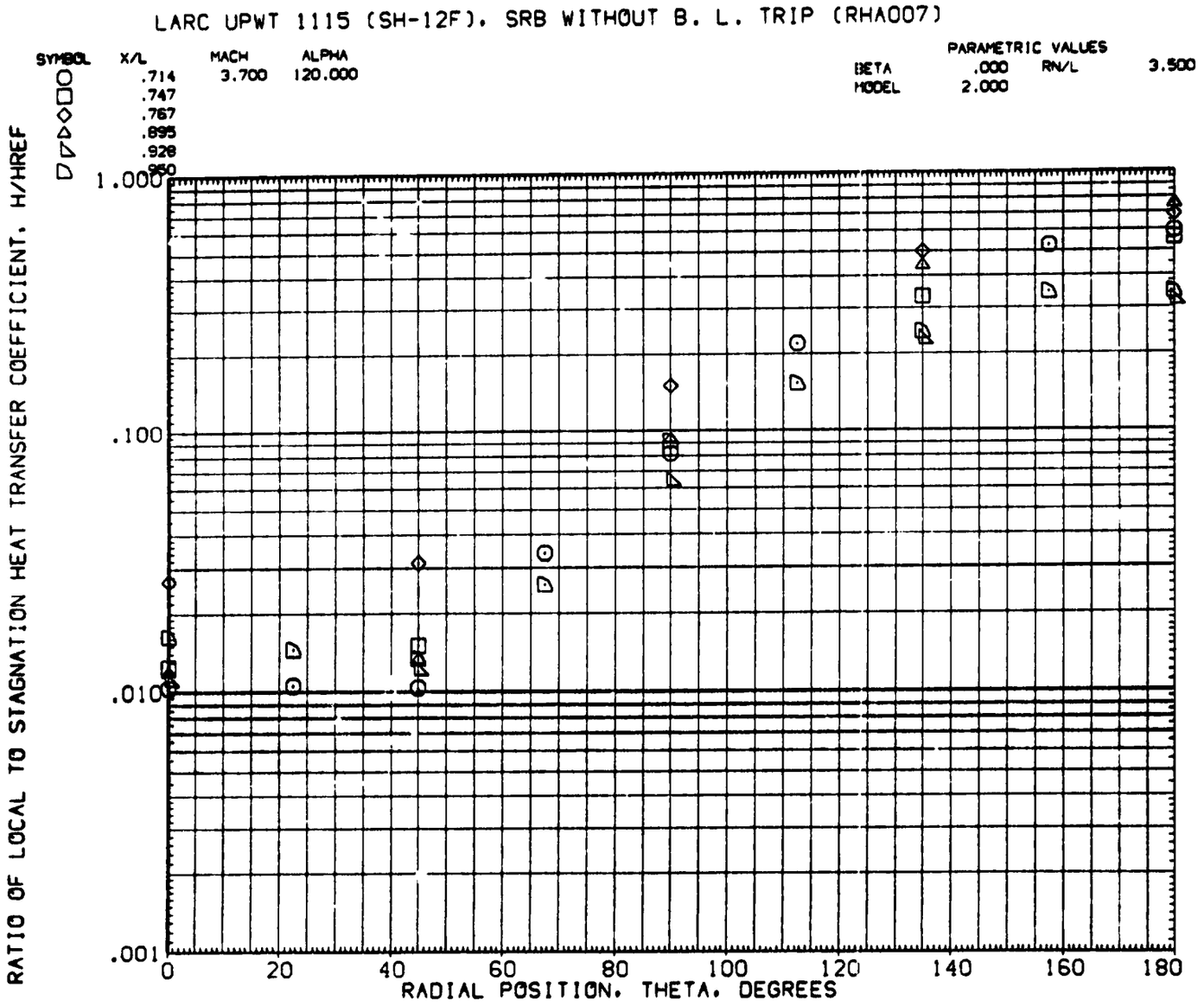


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

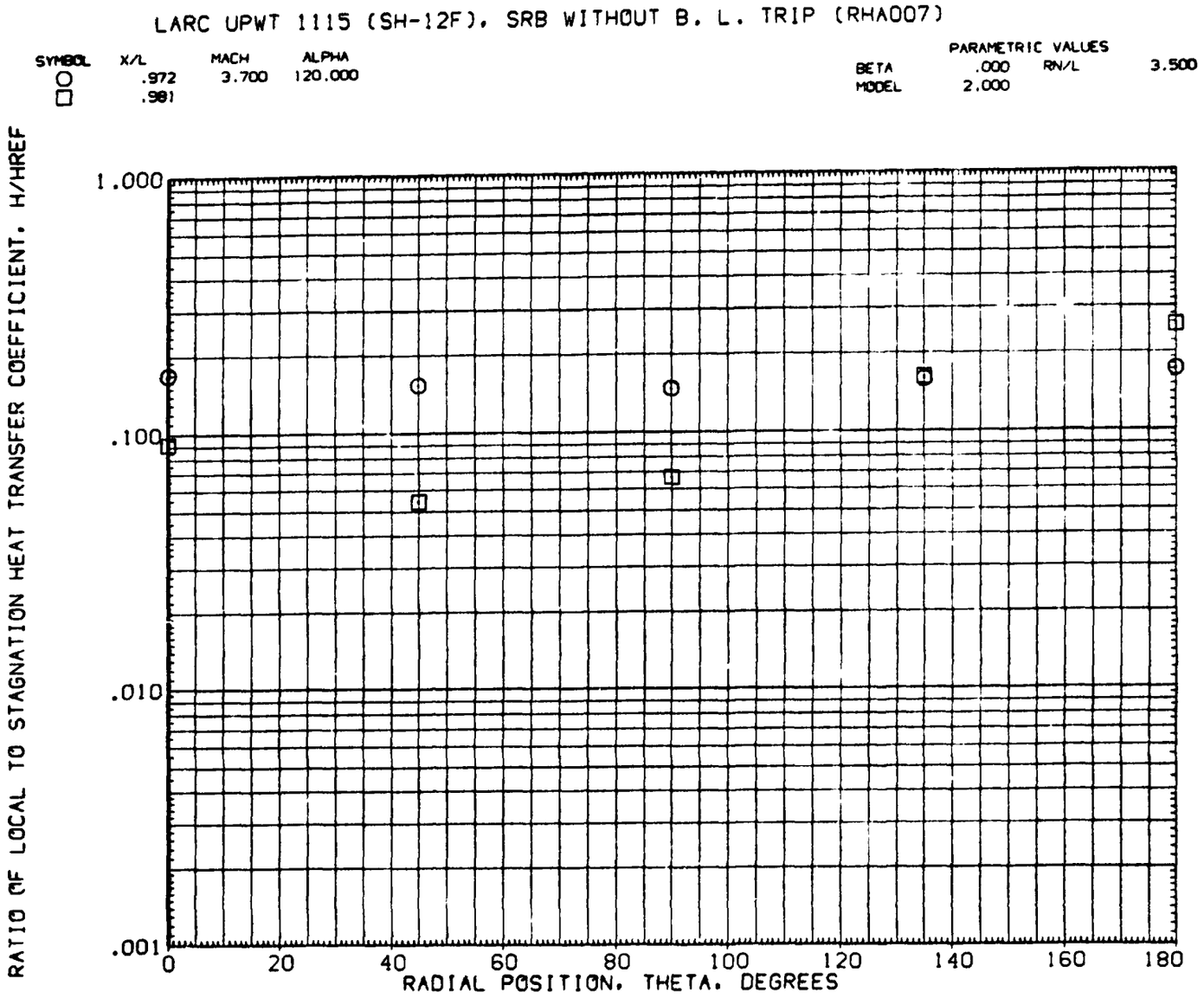


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

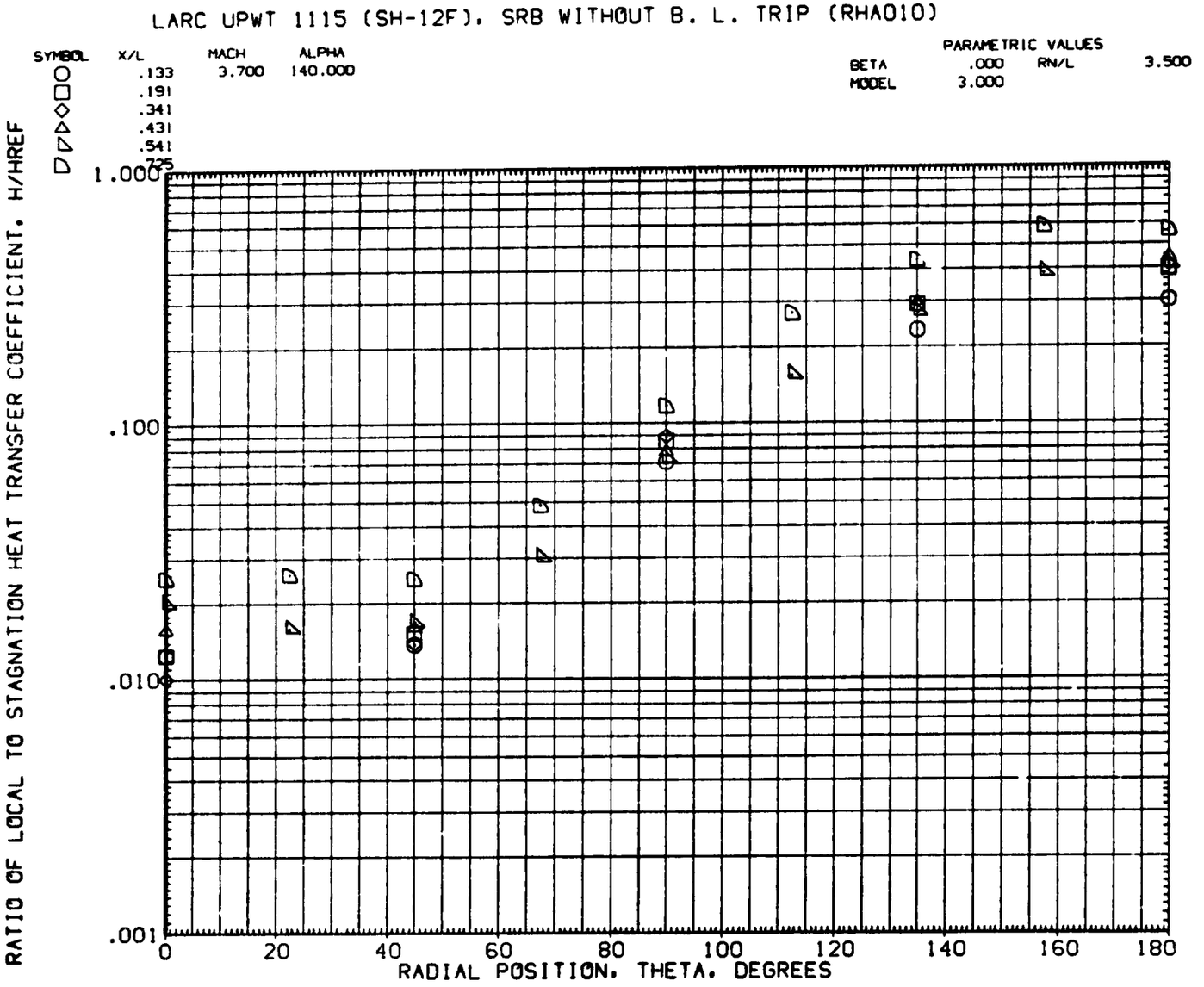


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

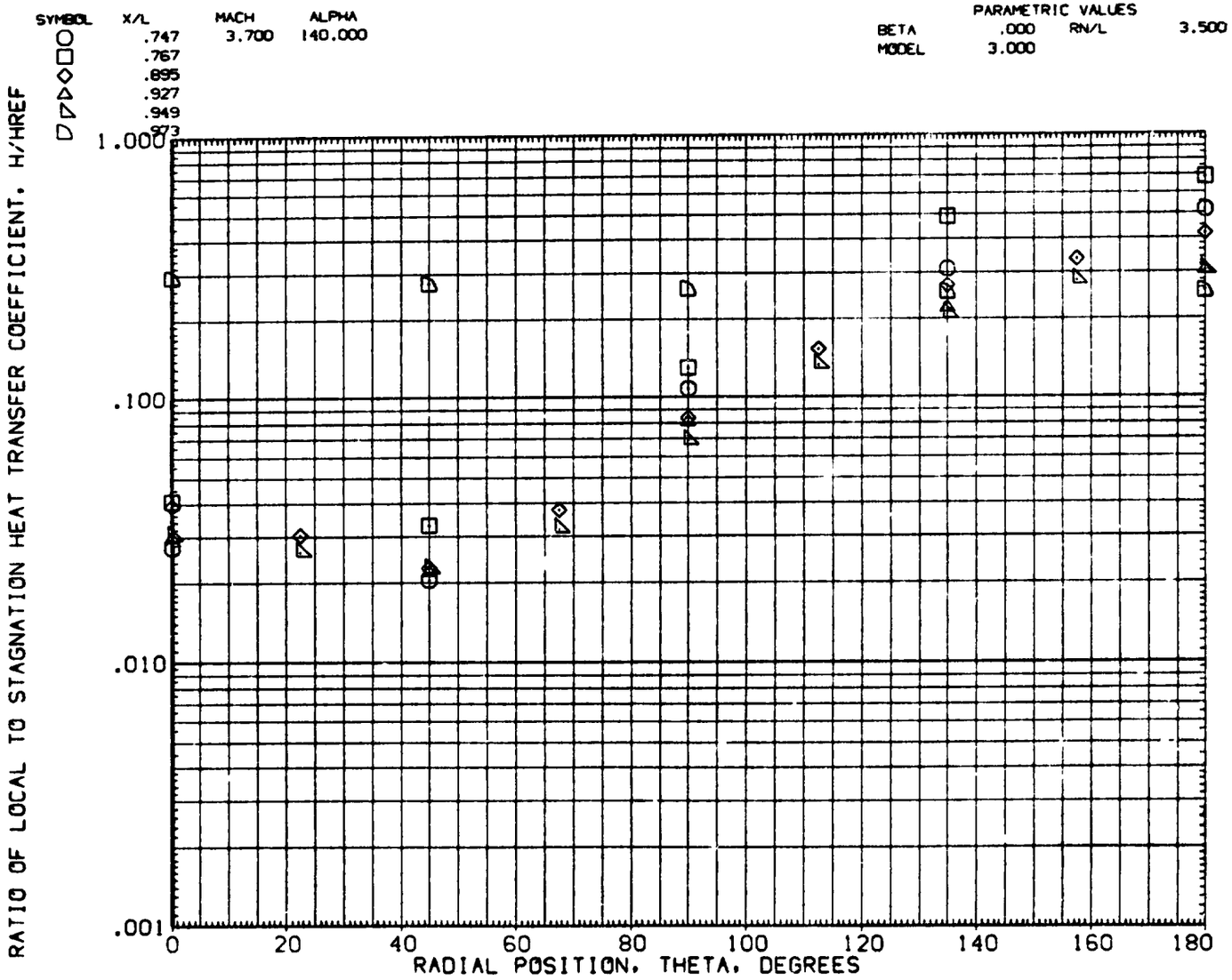


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP.RN/L=3.5)

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA010)

SYMBOL	X/L	MACH	ALPHA
O	.981	3.700	140.000

PARAMETRIC VALUES

BETA .000 RN/L 3.500

MODEL 3.000

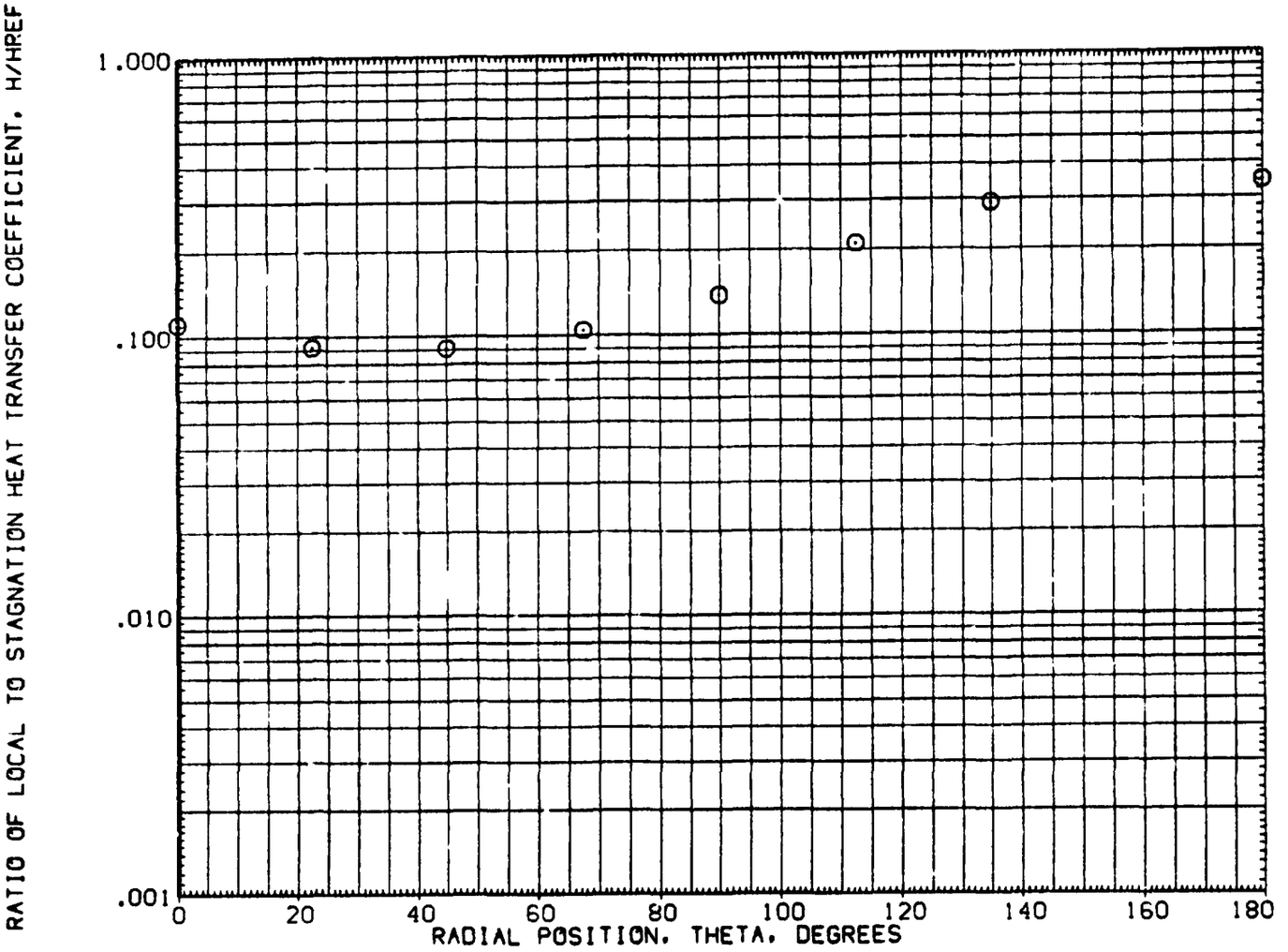


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

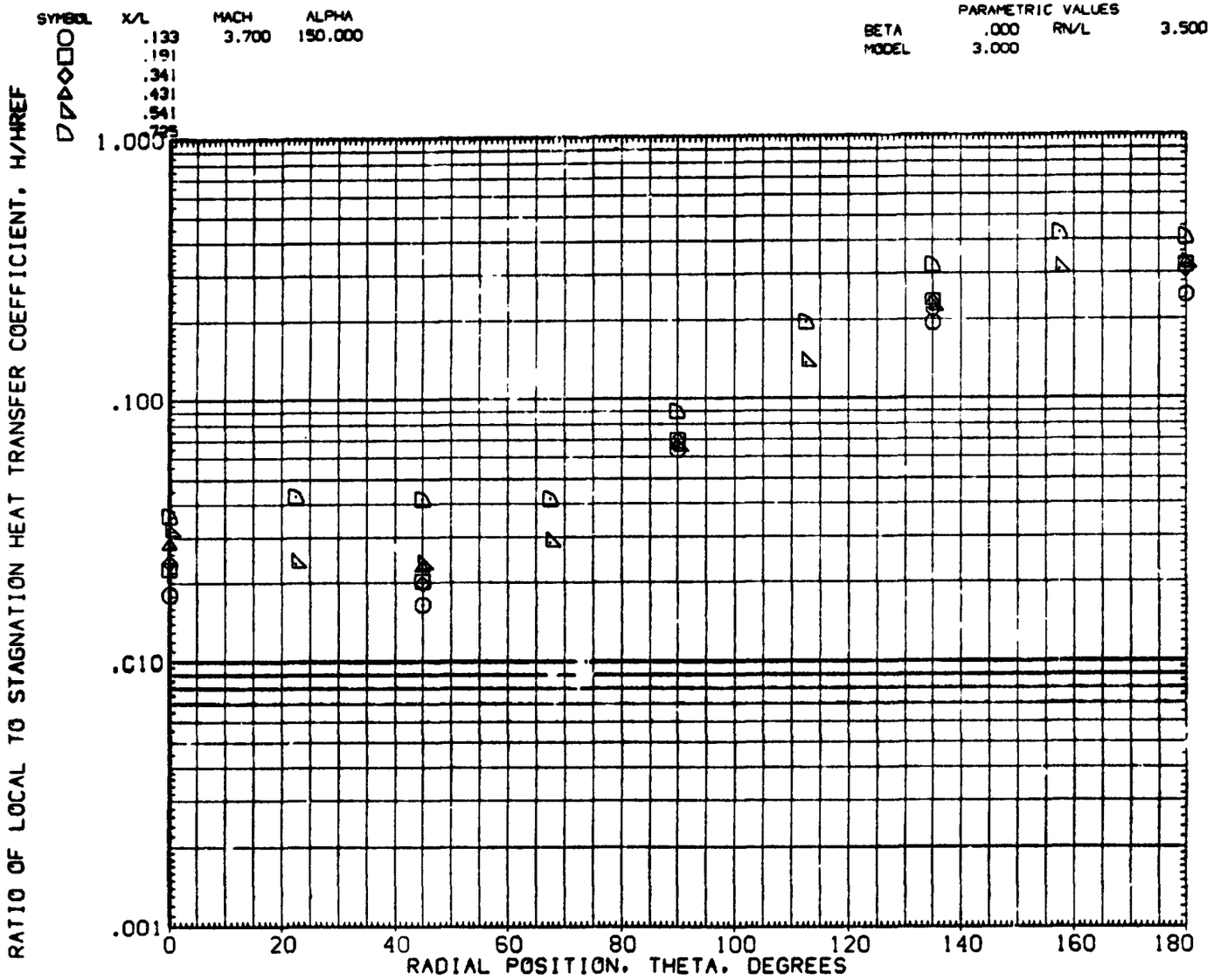


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

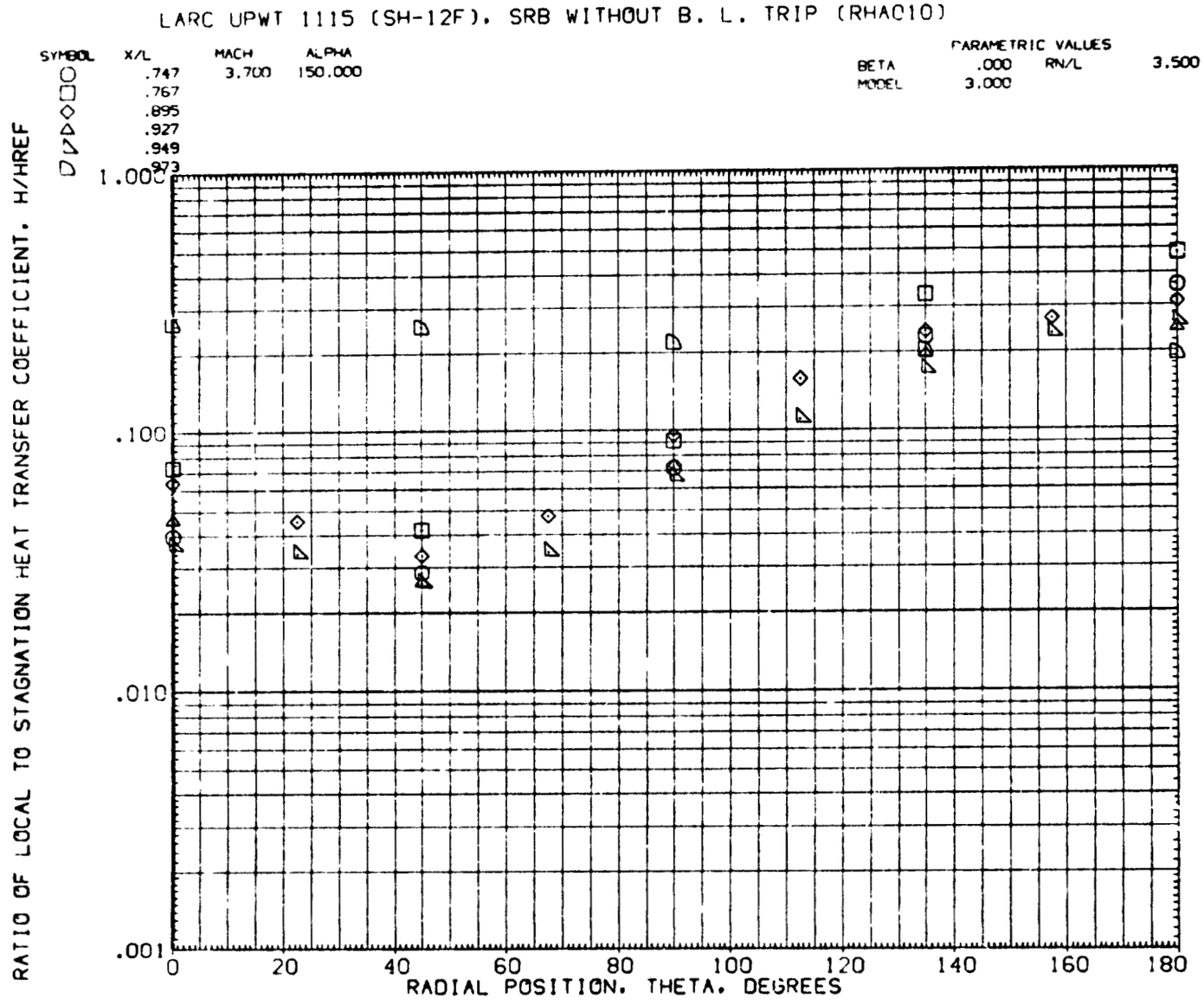


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP.RN/L=3.5)

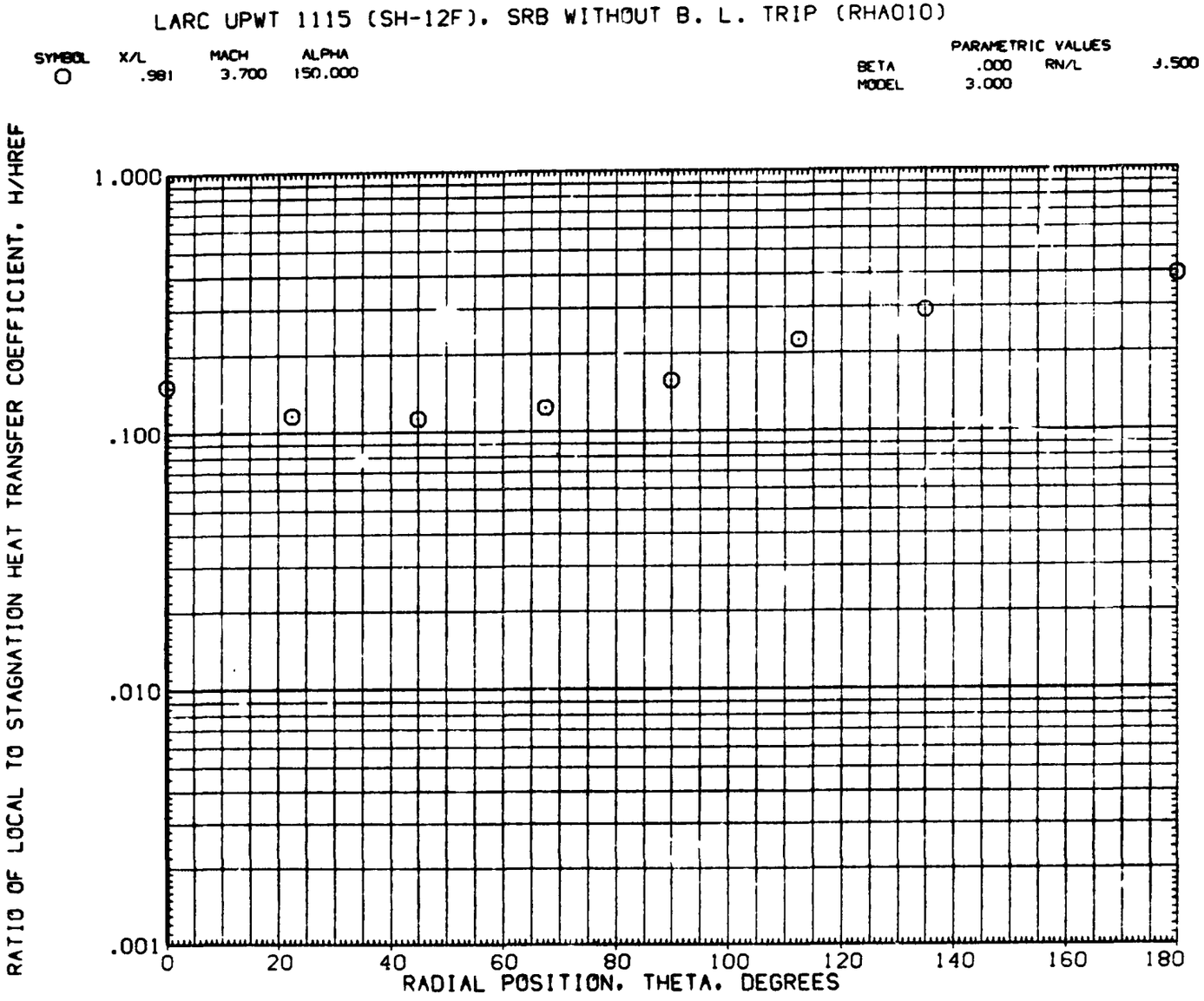


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

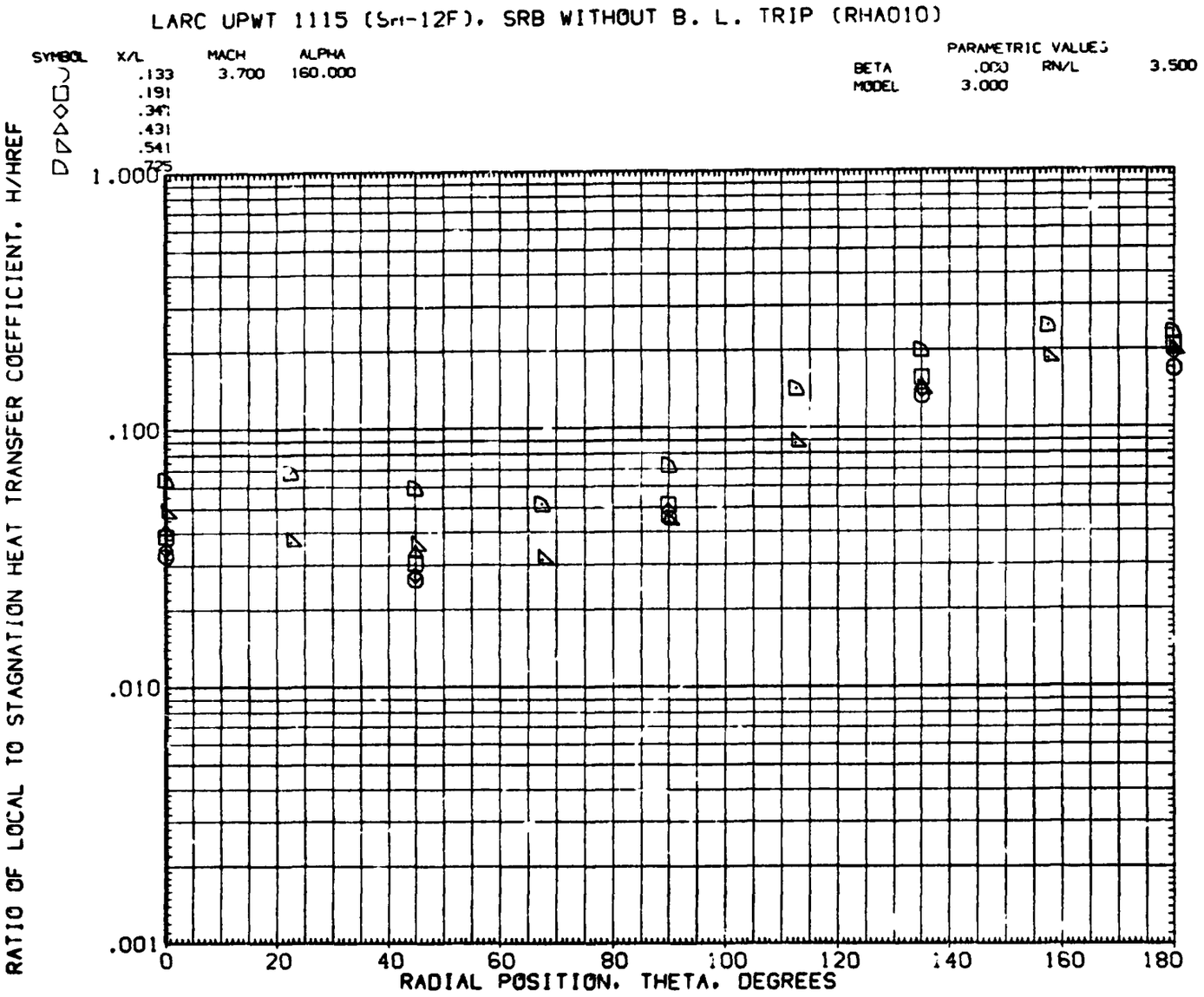


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

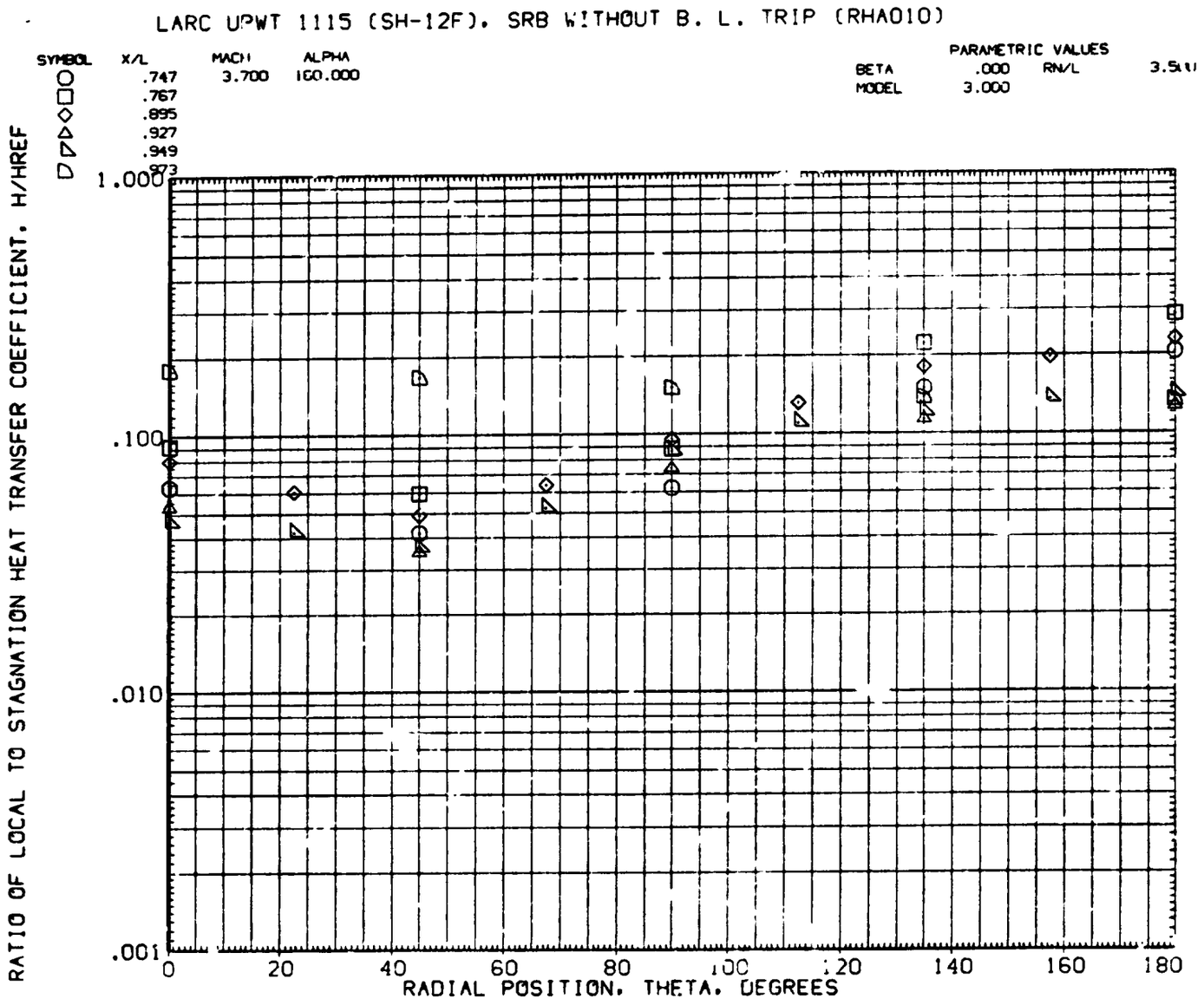


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

LARC UPWT 1115 (SH-12F). SRB WITHOUT B. L. TRIP (RHA010)

SYMBOL	X/L	MACH	ALPHA
O	.981	3.700	160.000

PARAMETRIC VALUES

BETA	.000	RN/L	3.500
MODEL	3.000		

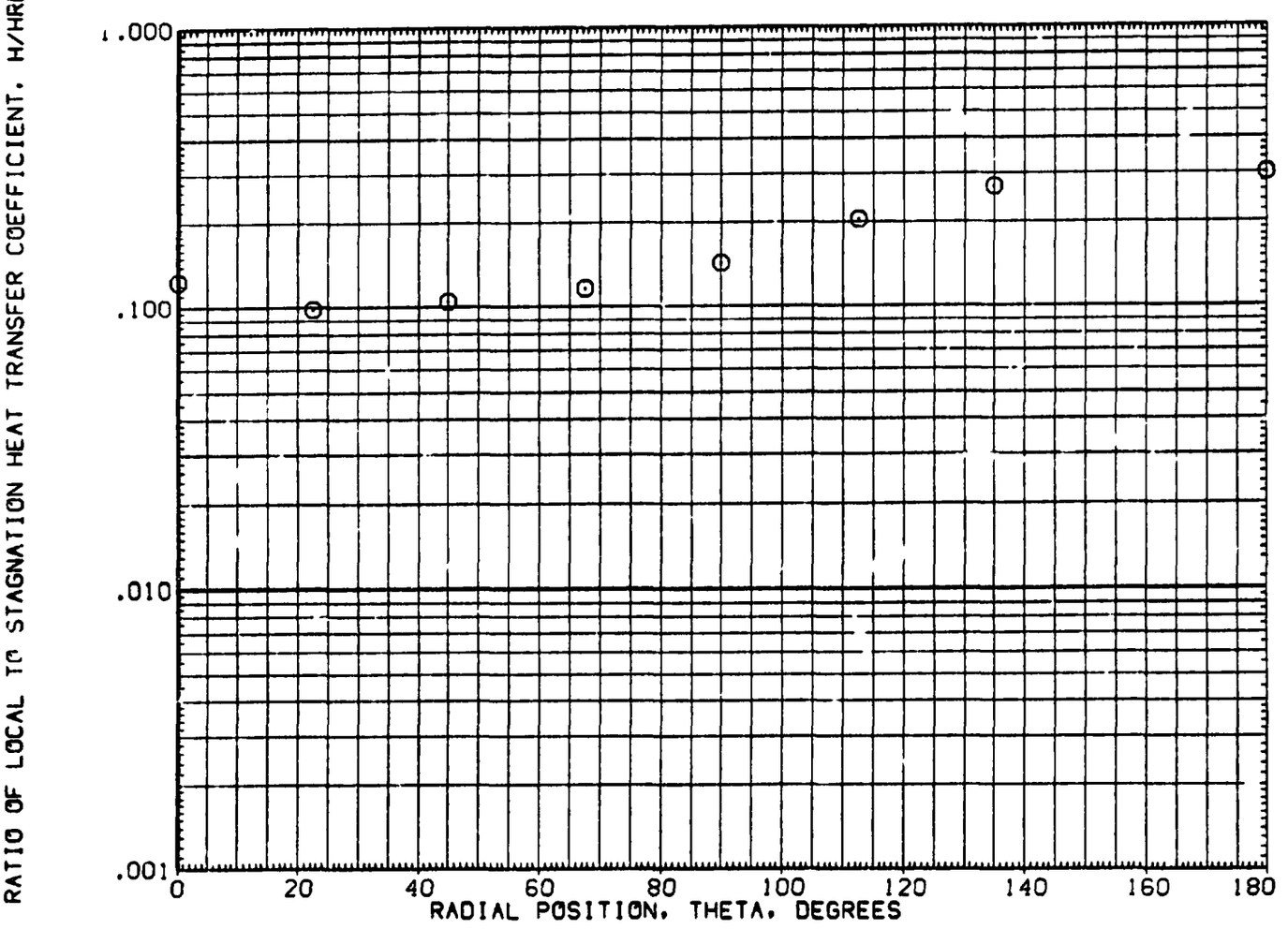


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

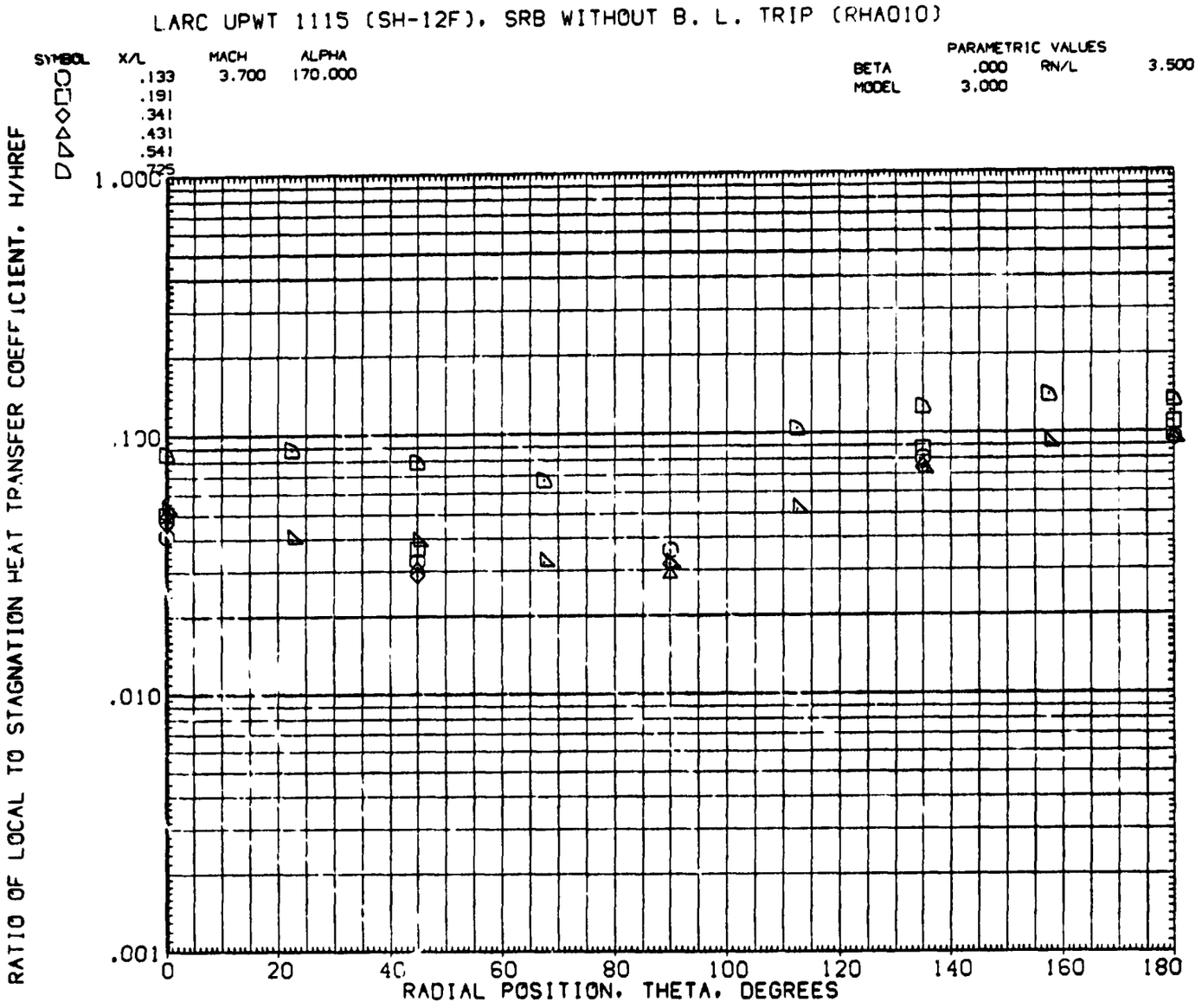


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

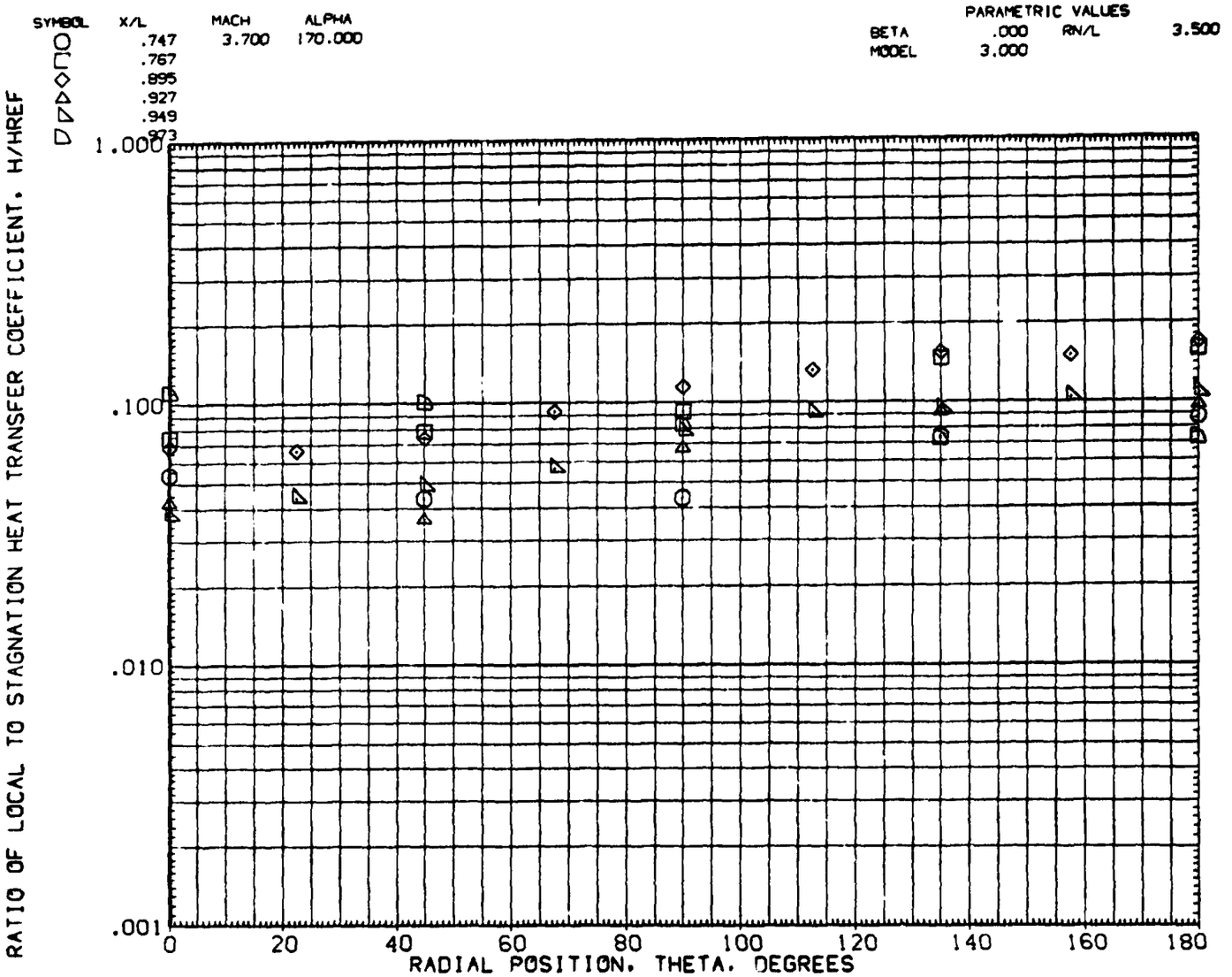


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

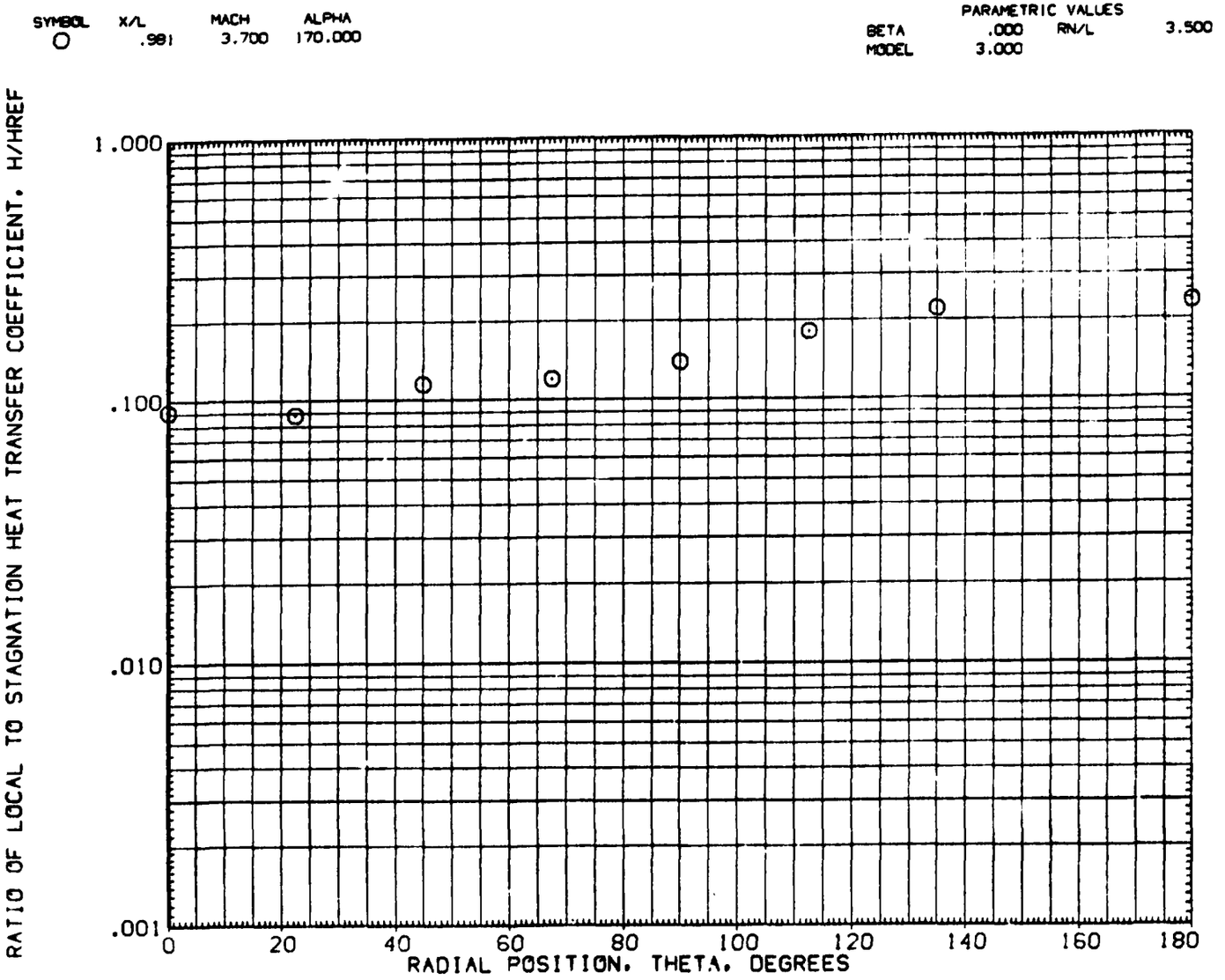


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

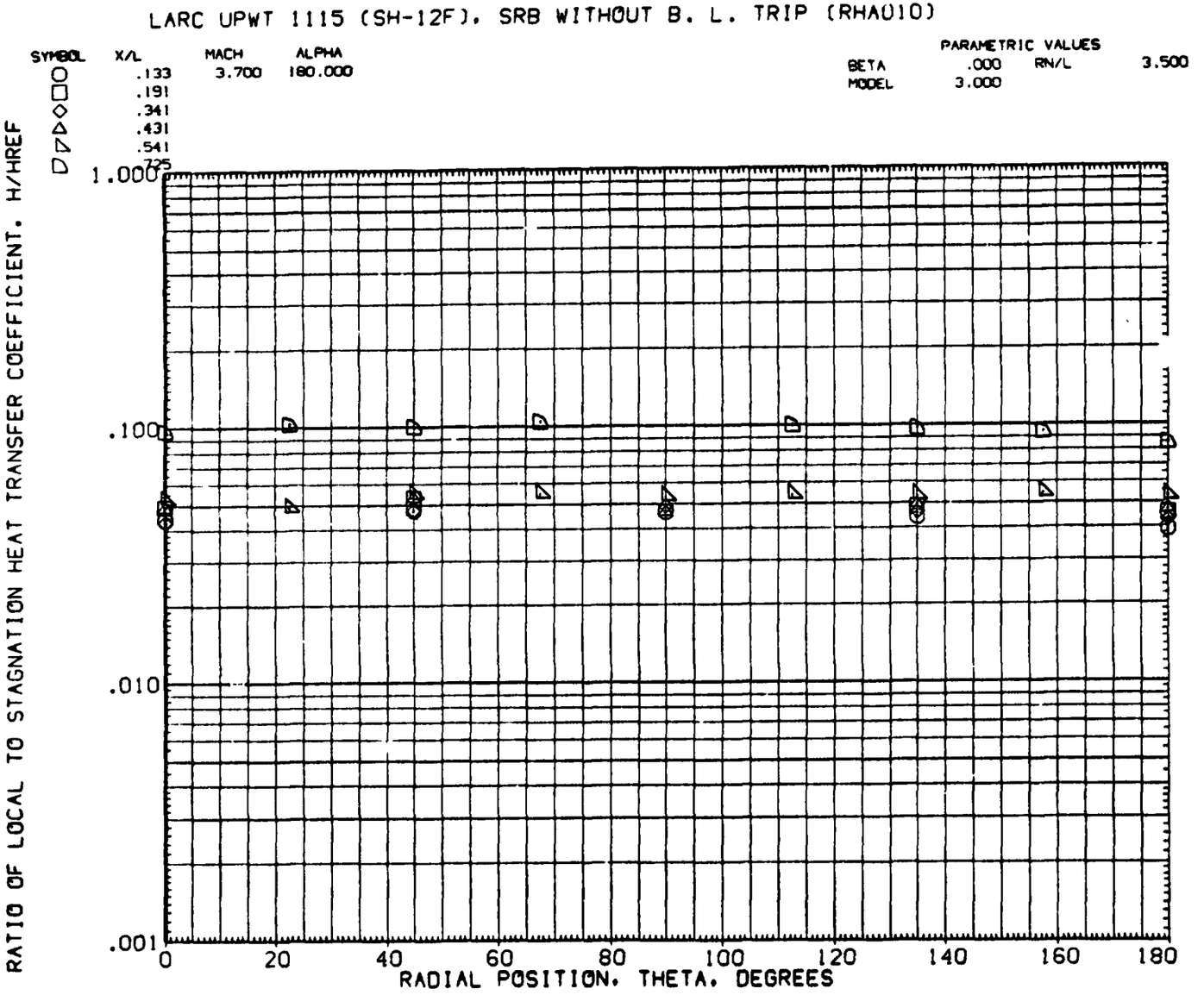


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

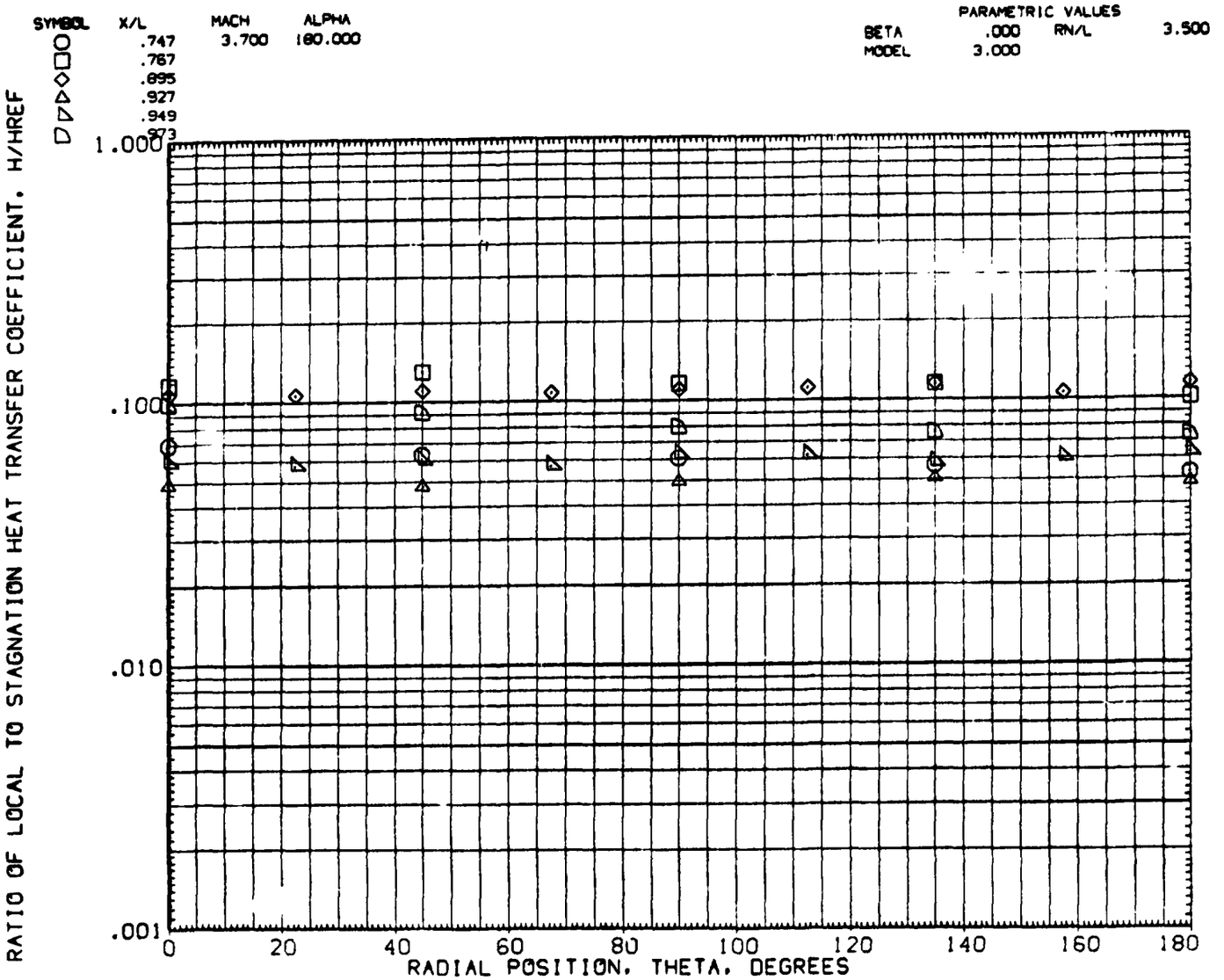


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA010)

SYMBOL	X/L	MACH	ALPHA
○	.981	3.700	180.000

PARAMETRIC VALUES

BETA	.000	RN/L	3.500
MODEL	3.000		

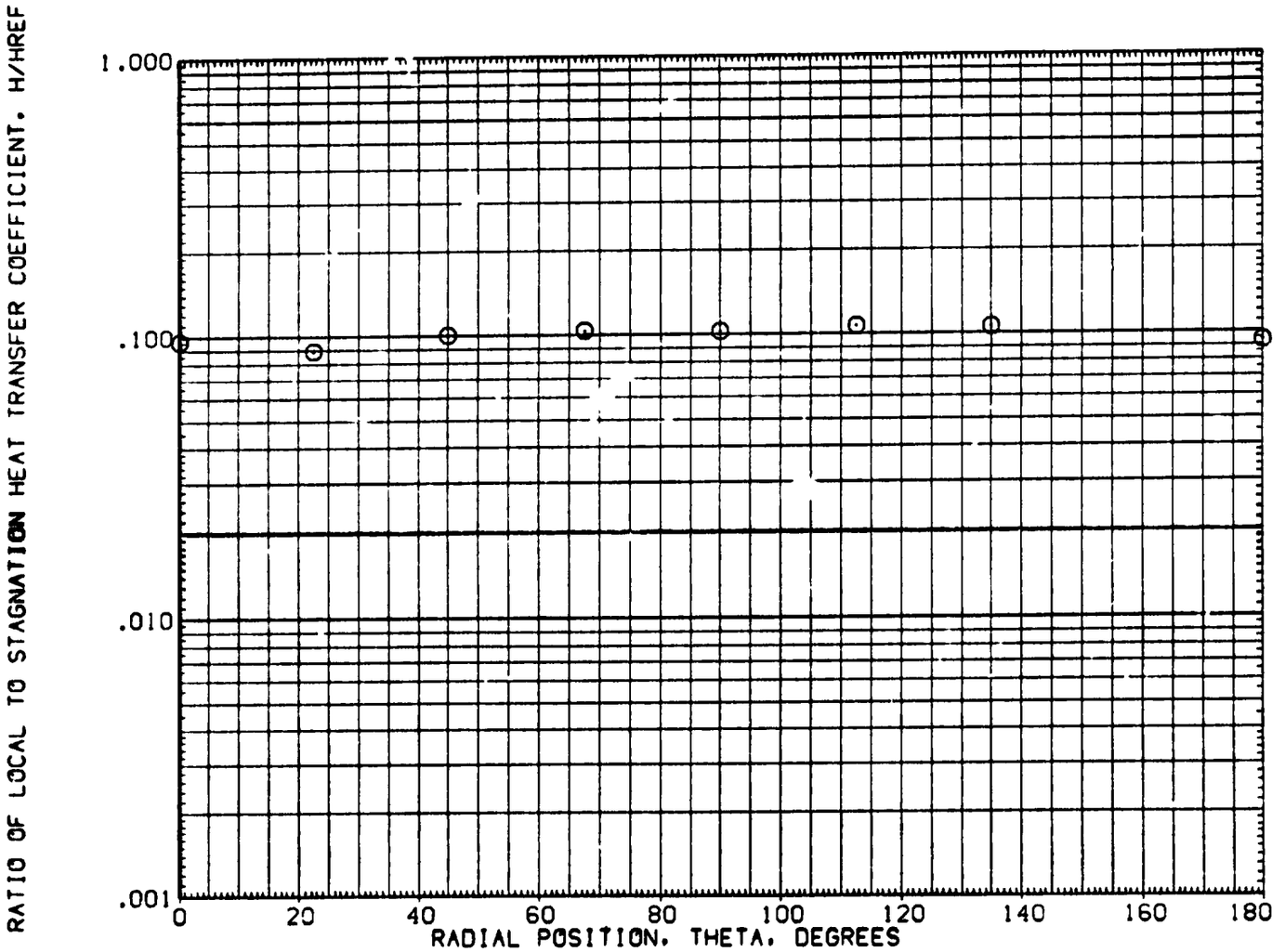


FIGURE 10 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP,RN/L=3.5)

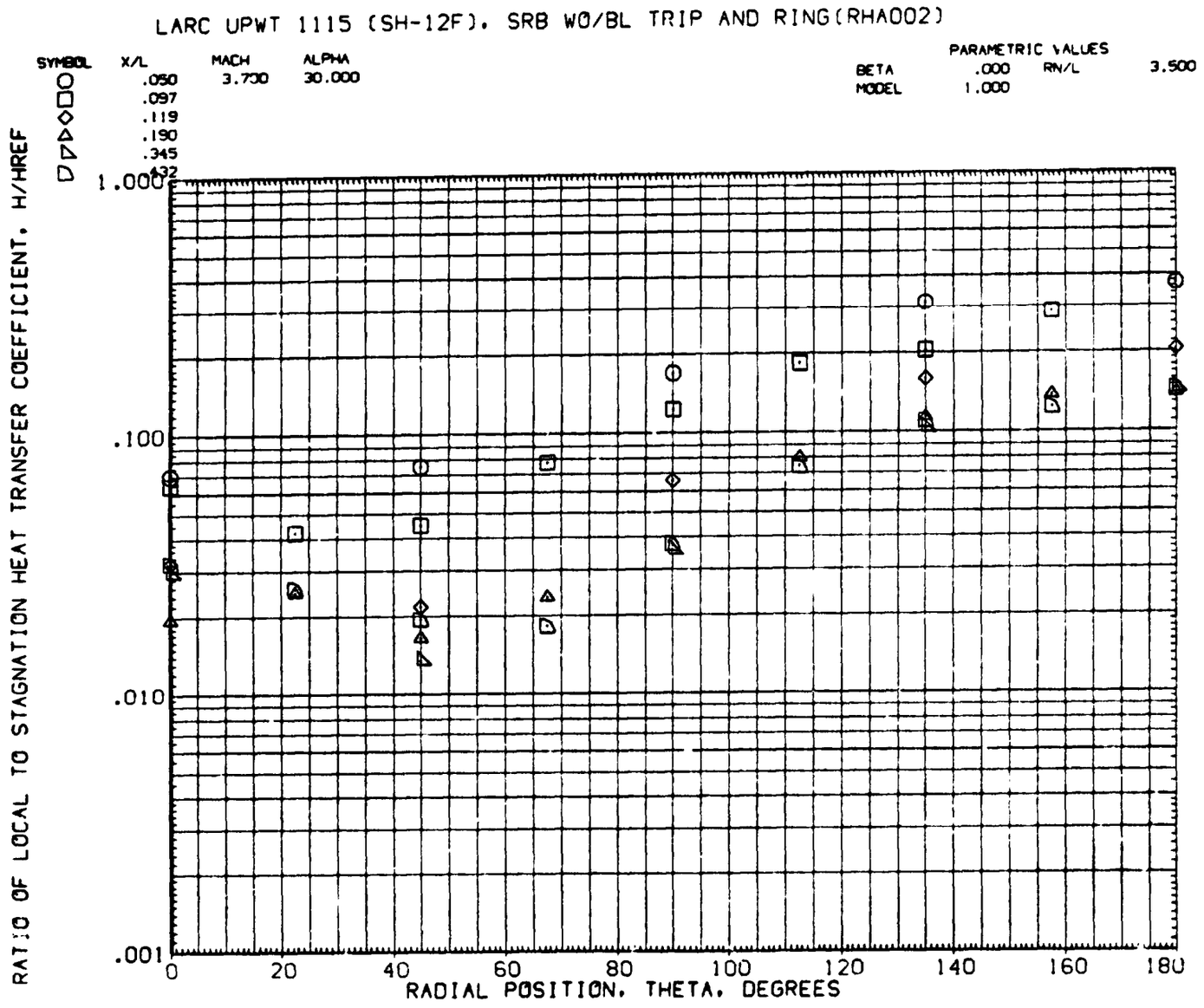


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

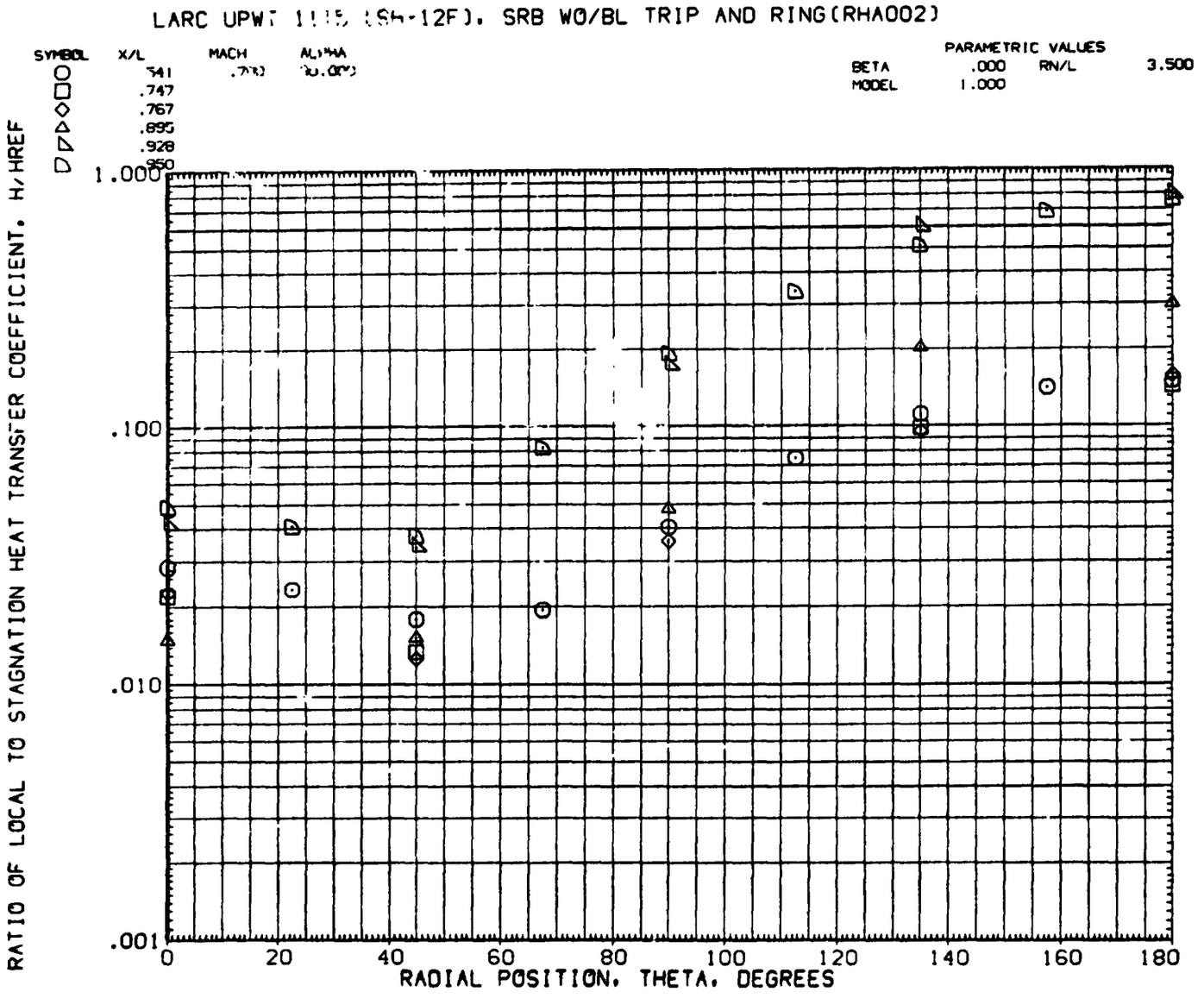


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

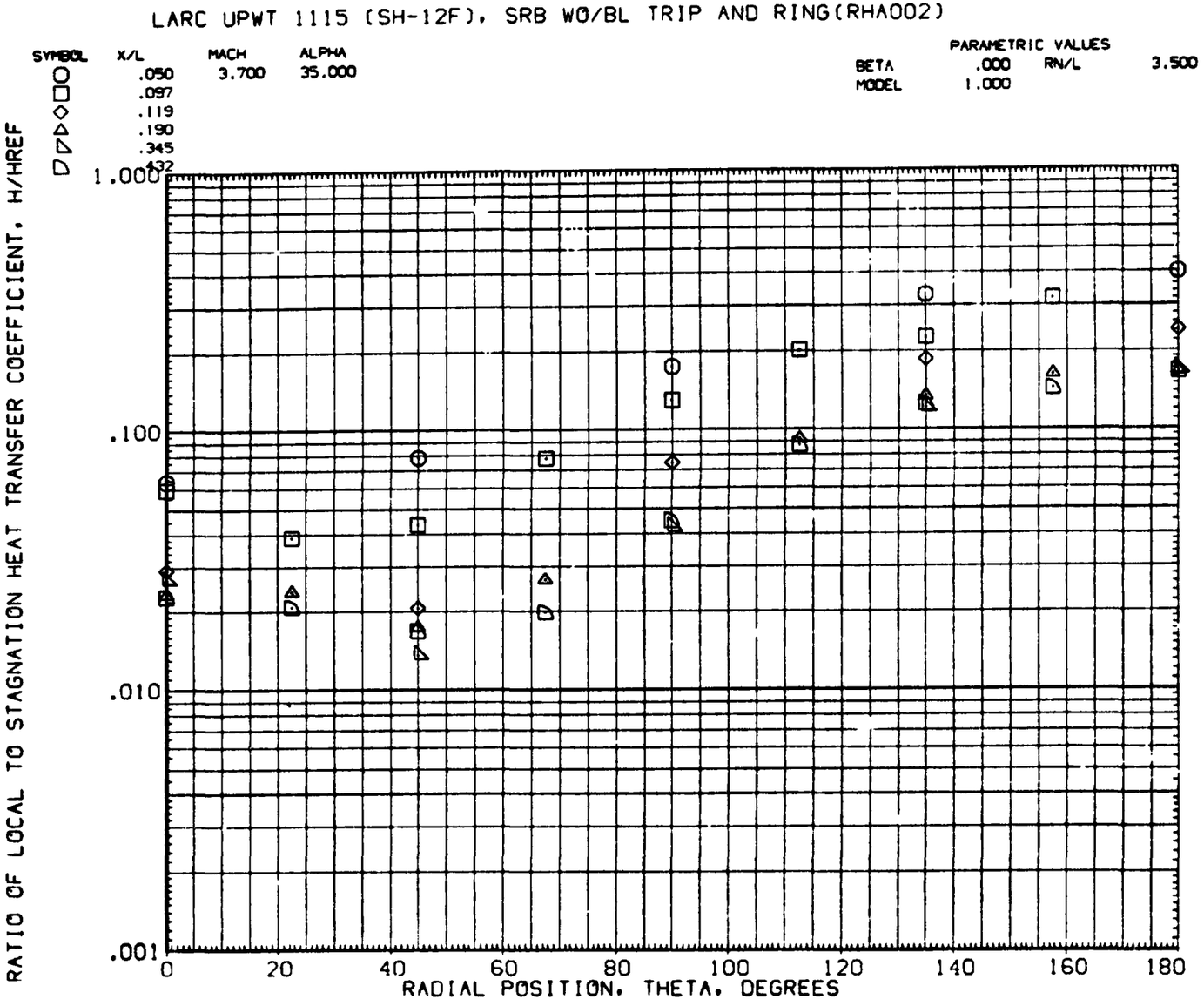


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

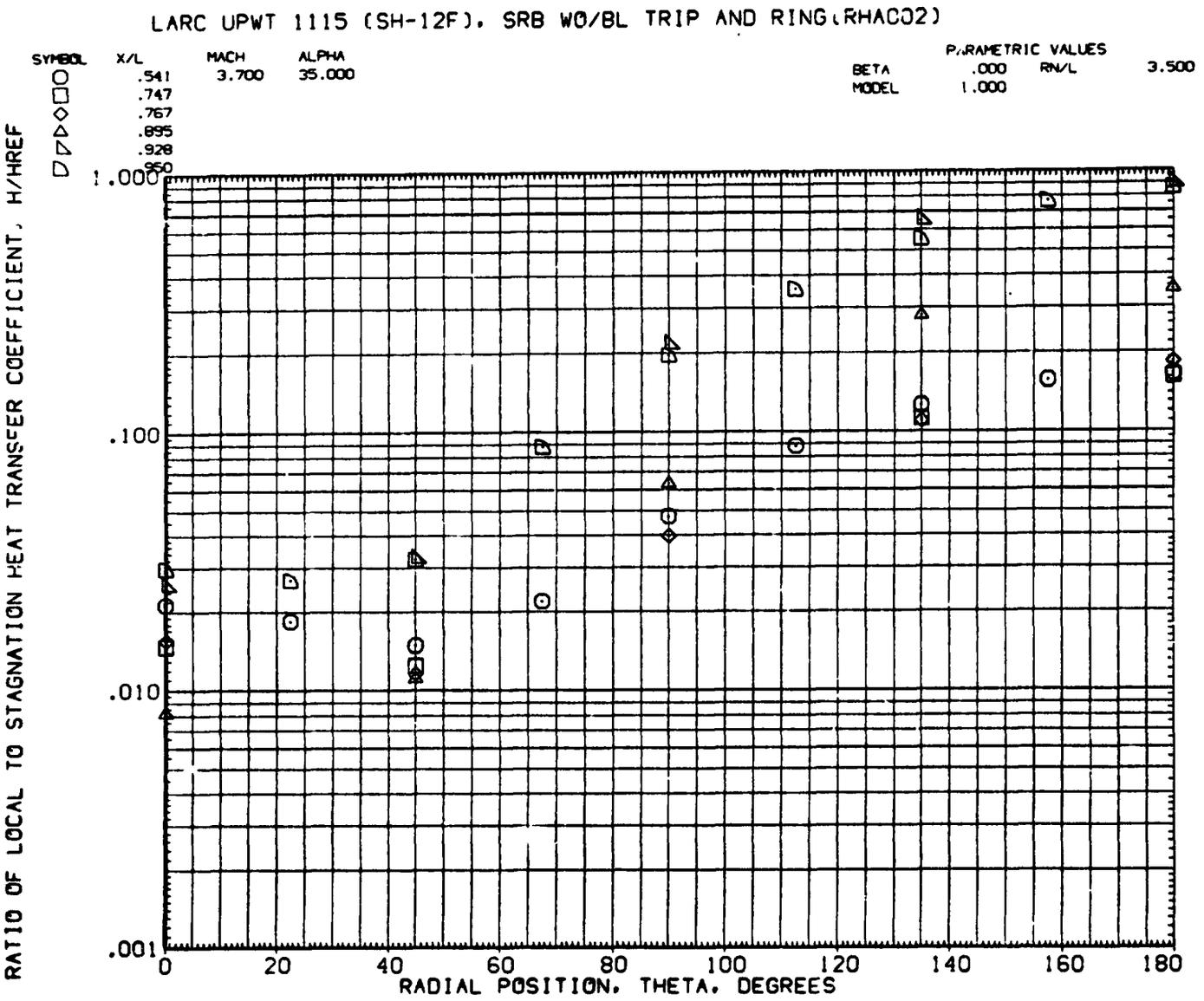


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

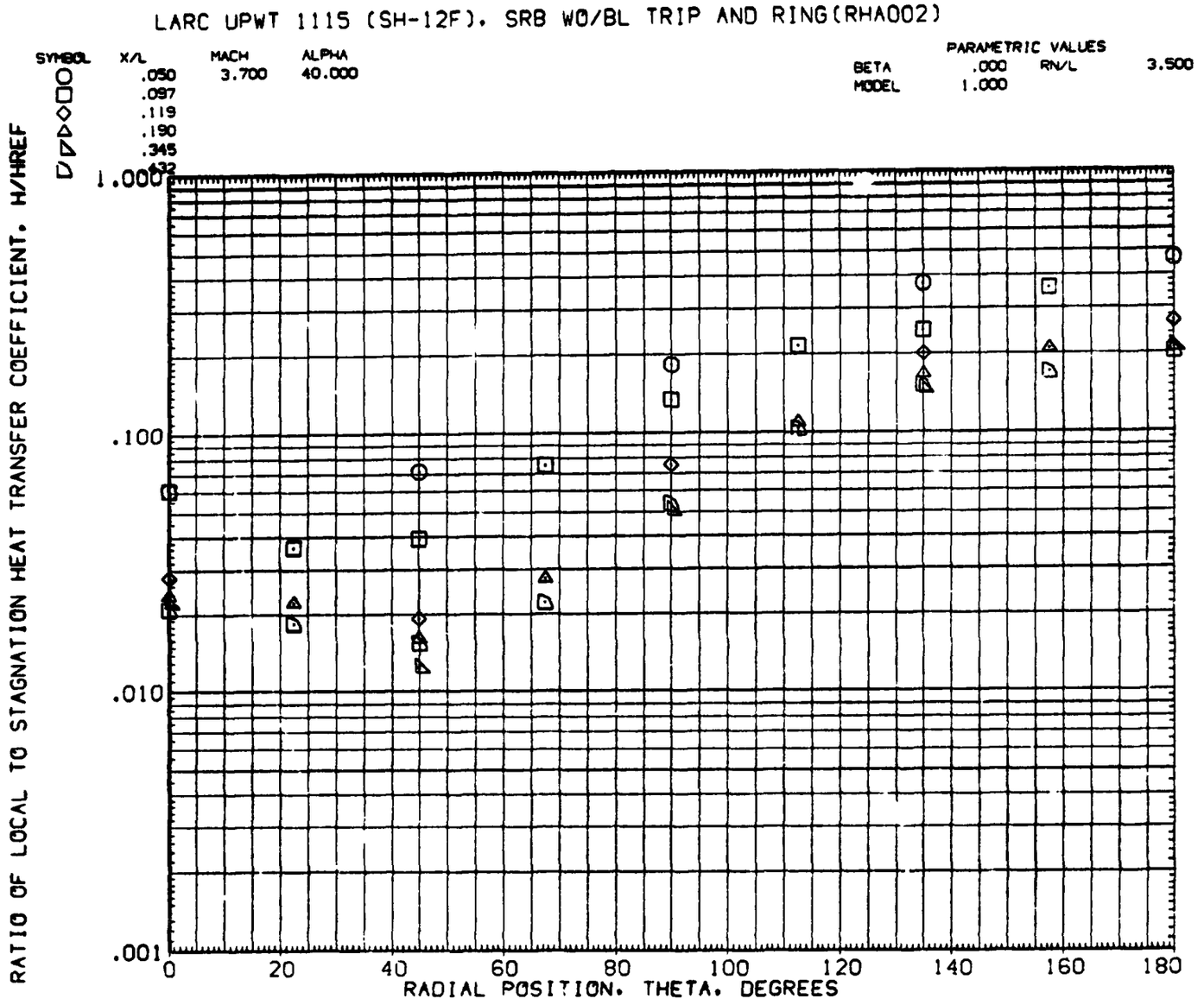


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/0 BNDRY LAYER TRIP AND RING)

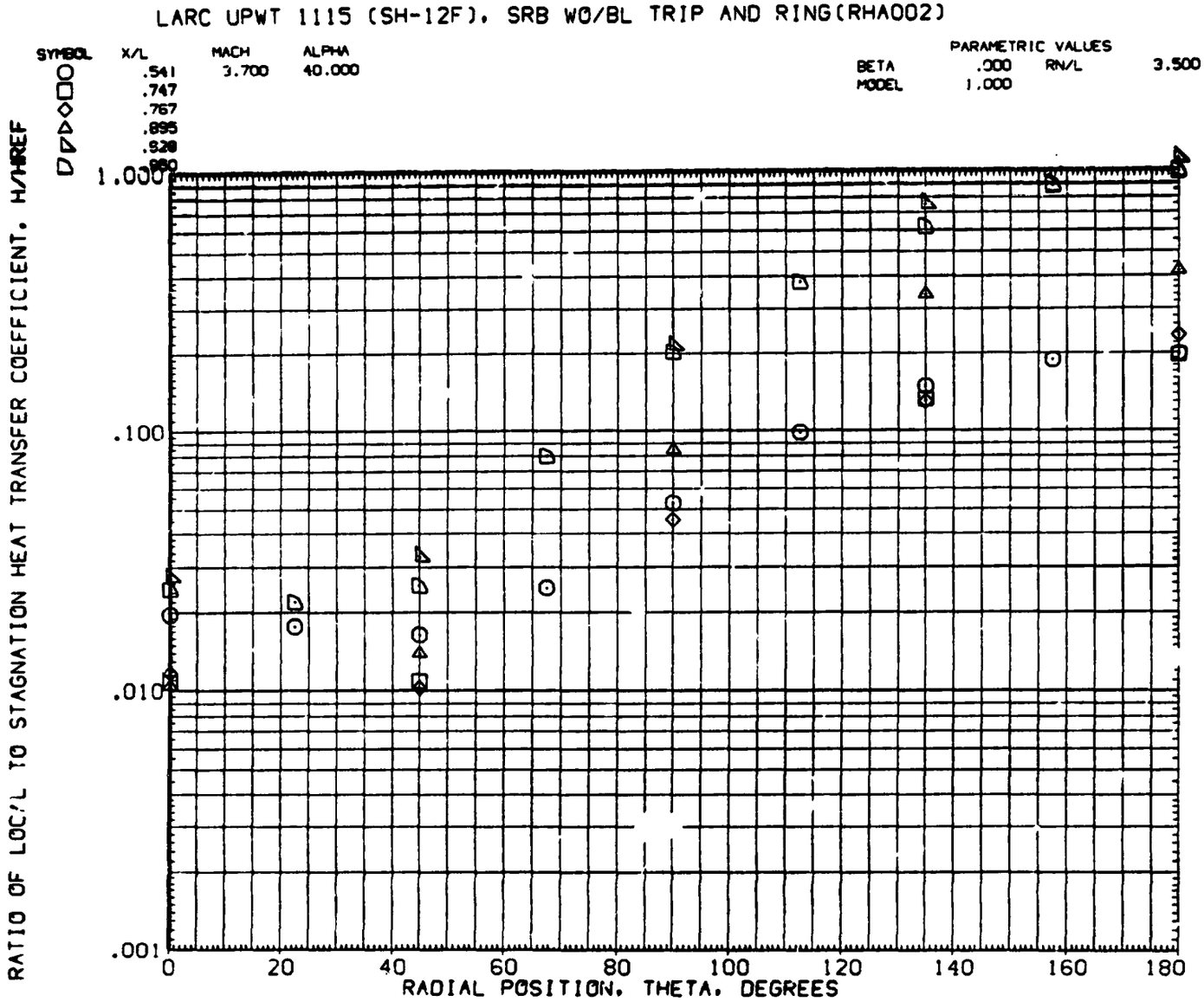


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

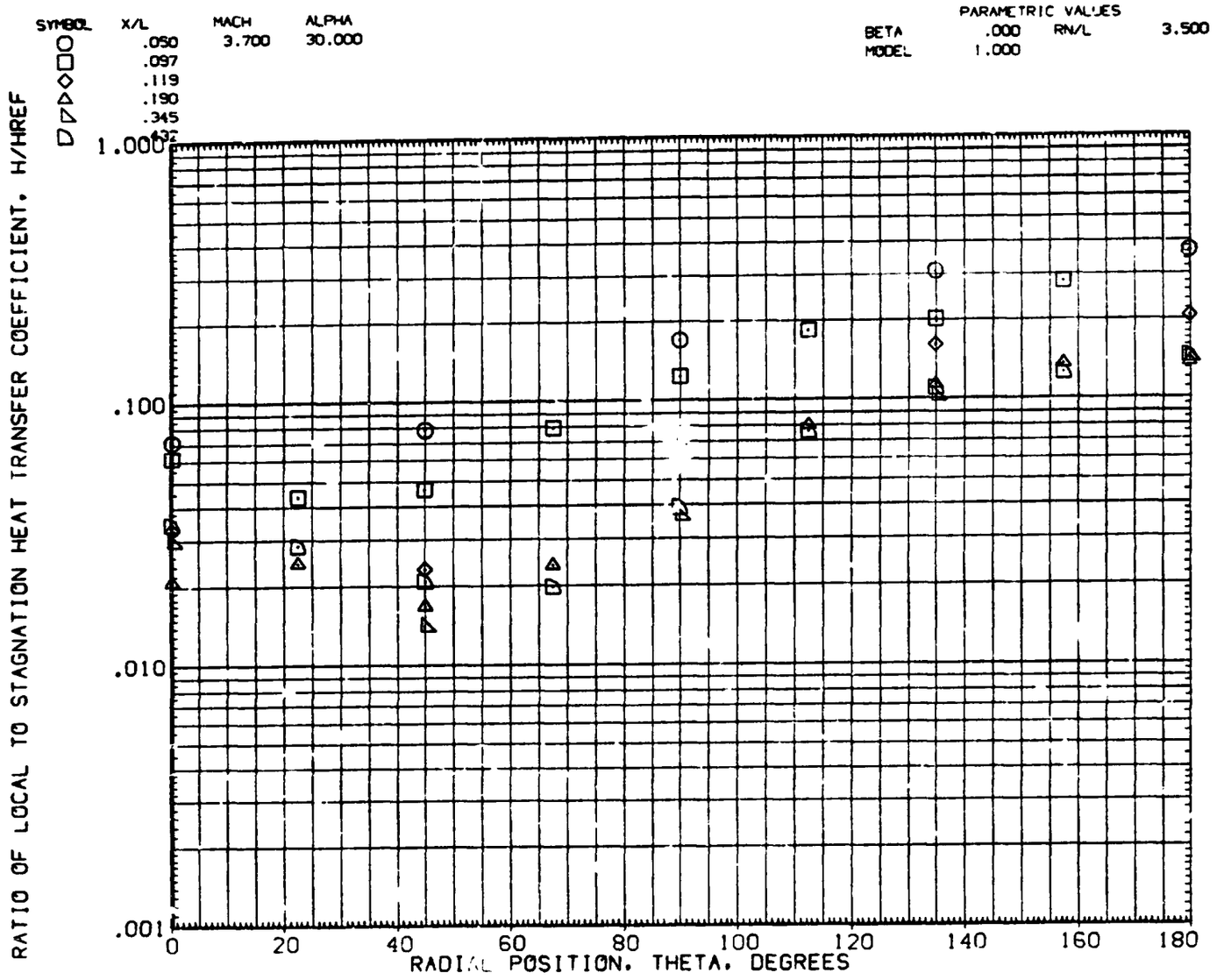


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

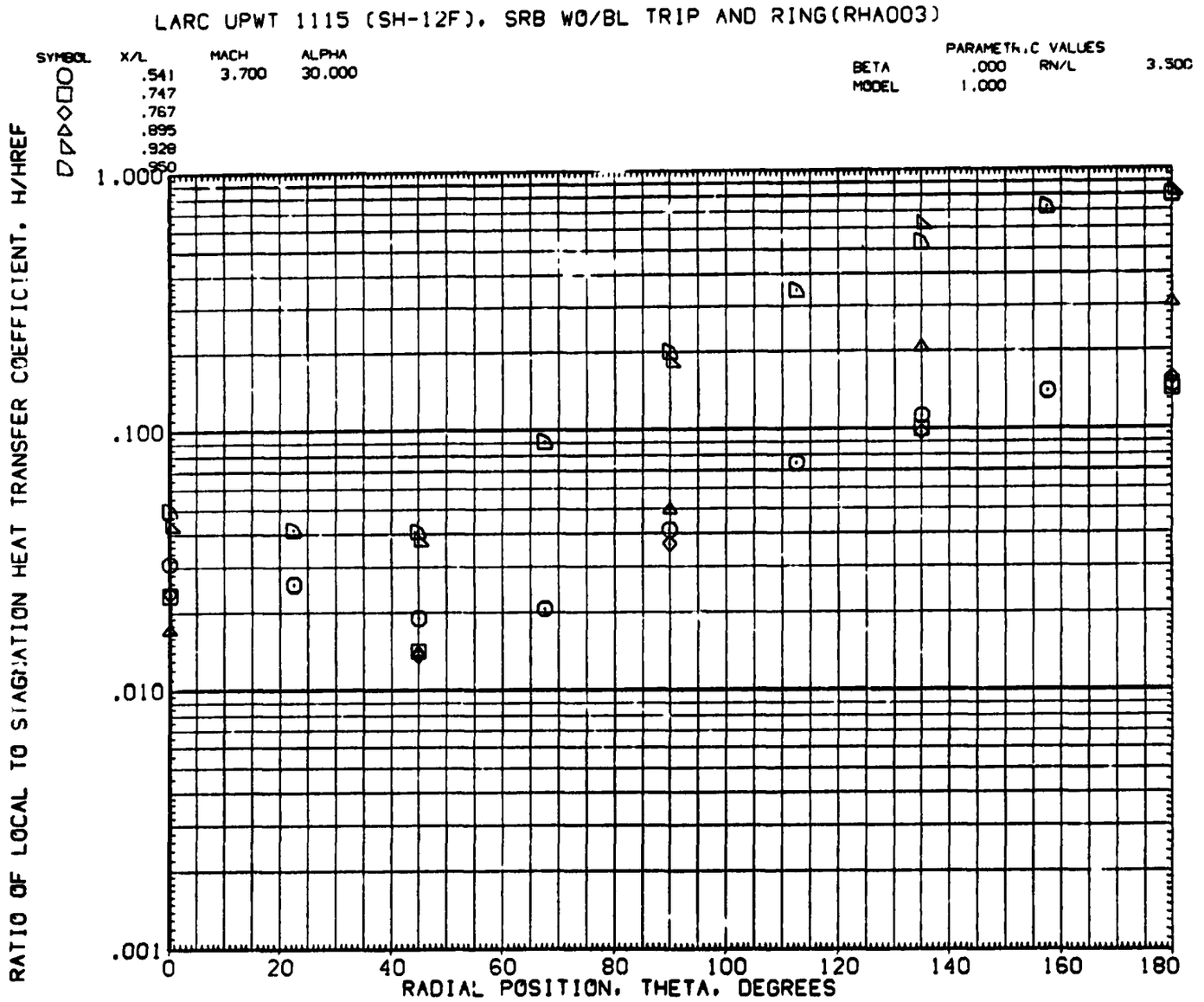


FIGURE 11 H/HREF RADIALLY AT VARIOUS X/L STATIONS(W/O BNDRY LAYER TRIP AND RING)

APPENDIX A

SCHLIEREN PHOTOGRAPHS

TABLE A-I

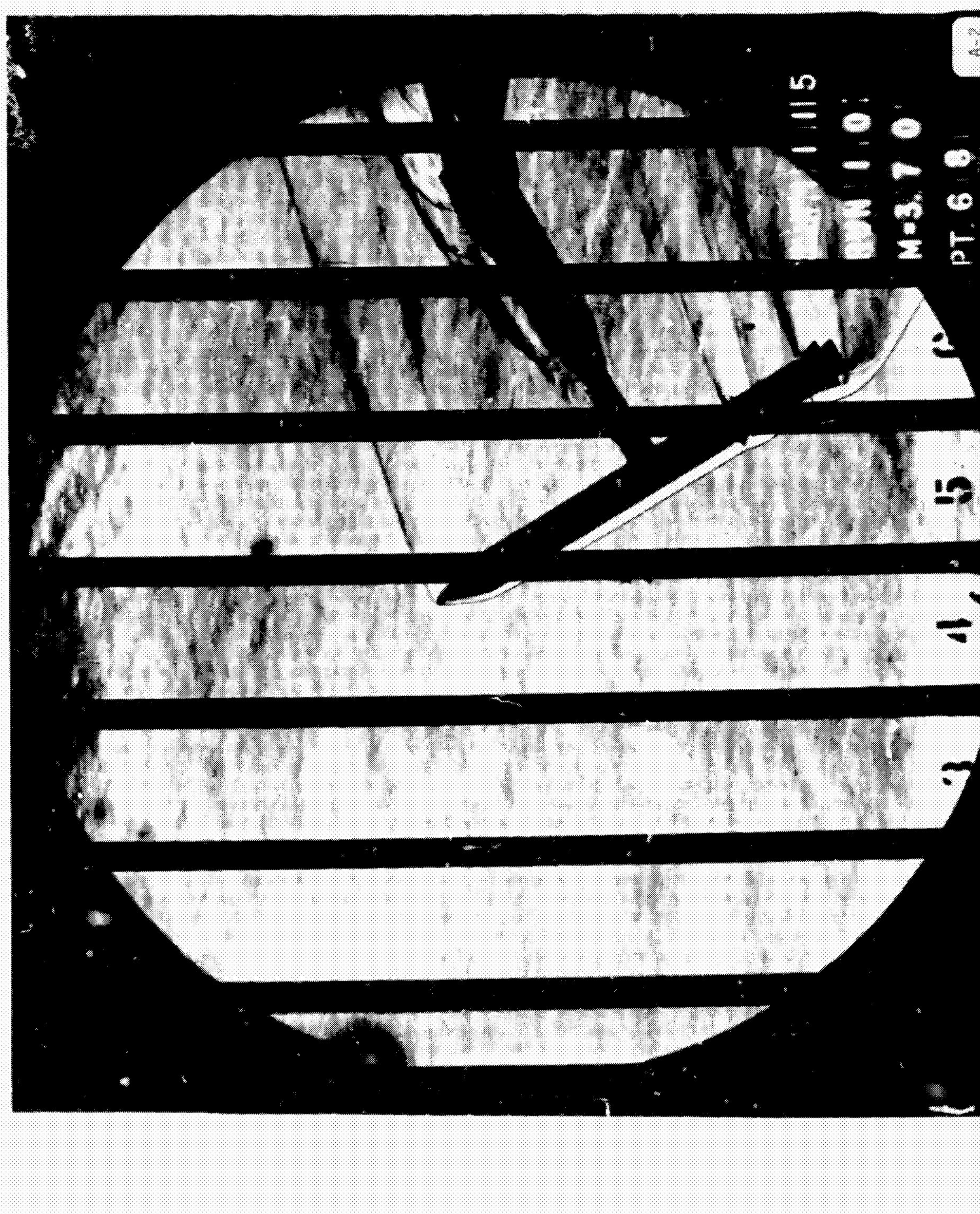
NASA - LANGLEY

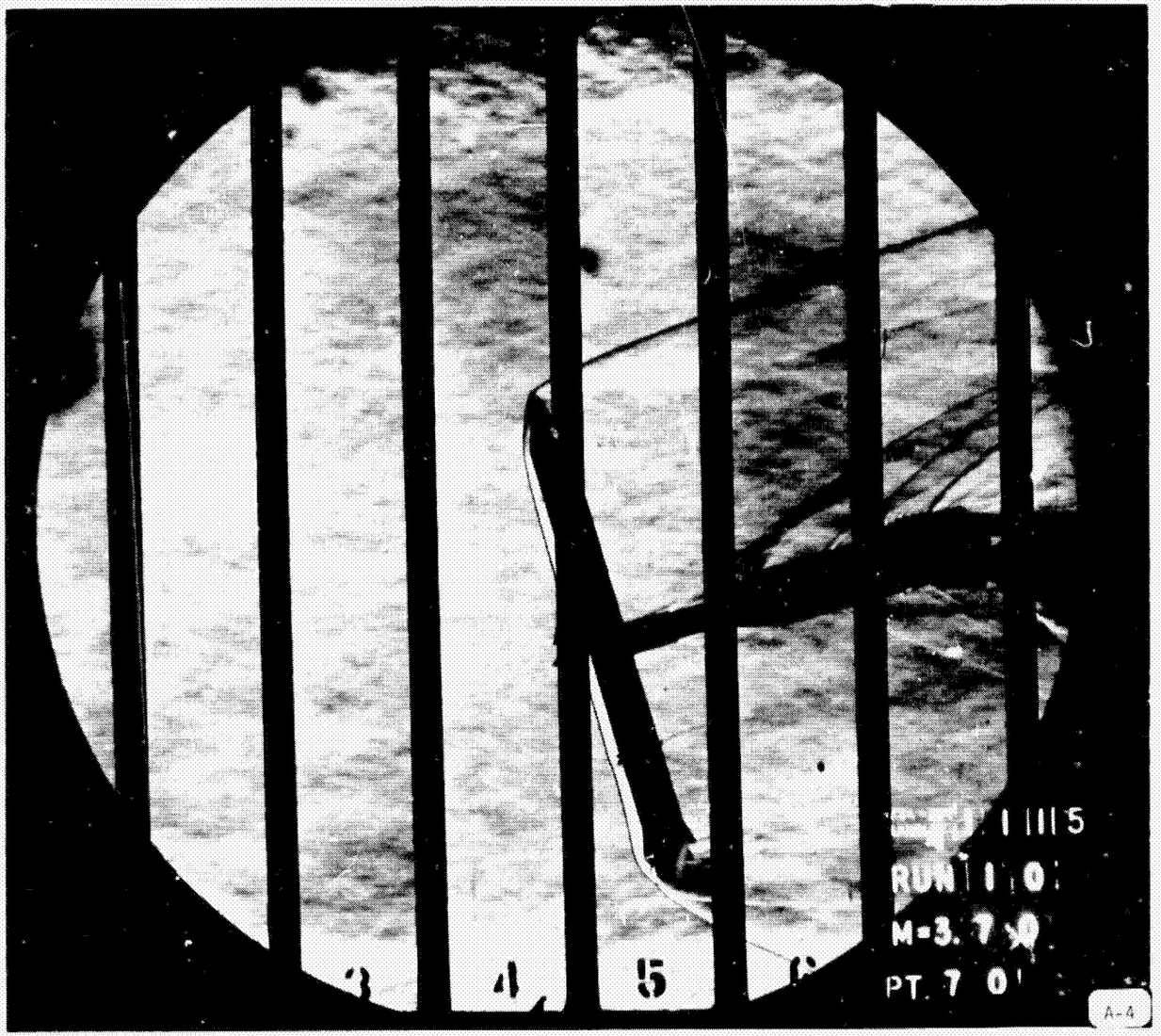
0.013-SCALE SRB MODEL (SH-12F)

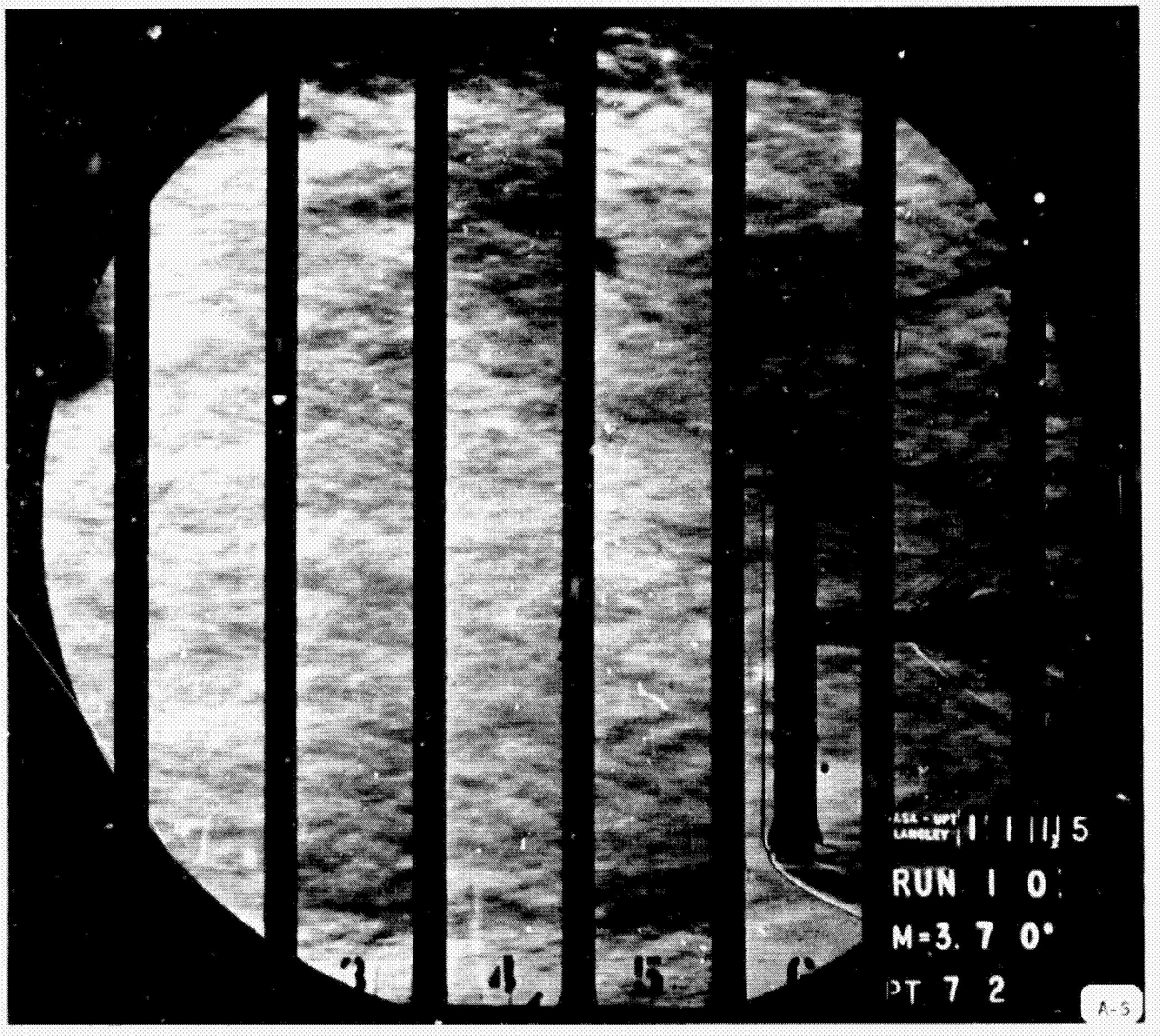
HEAT TRANSFER TESTS - UPWT PROJECT 1115

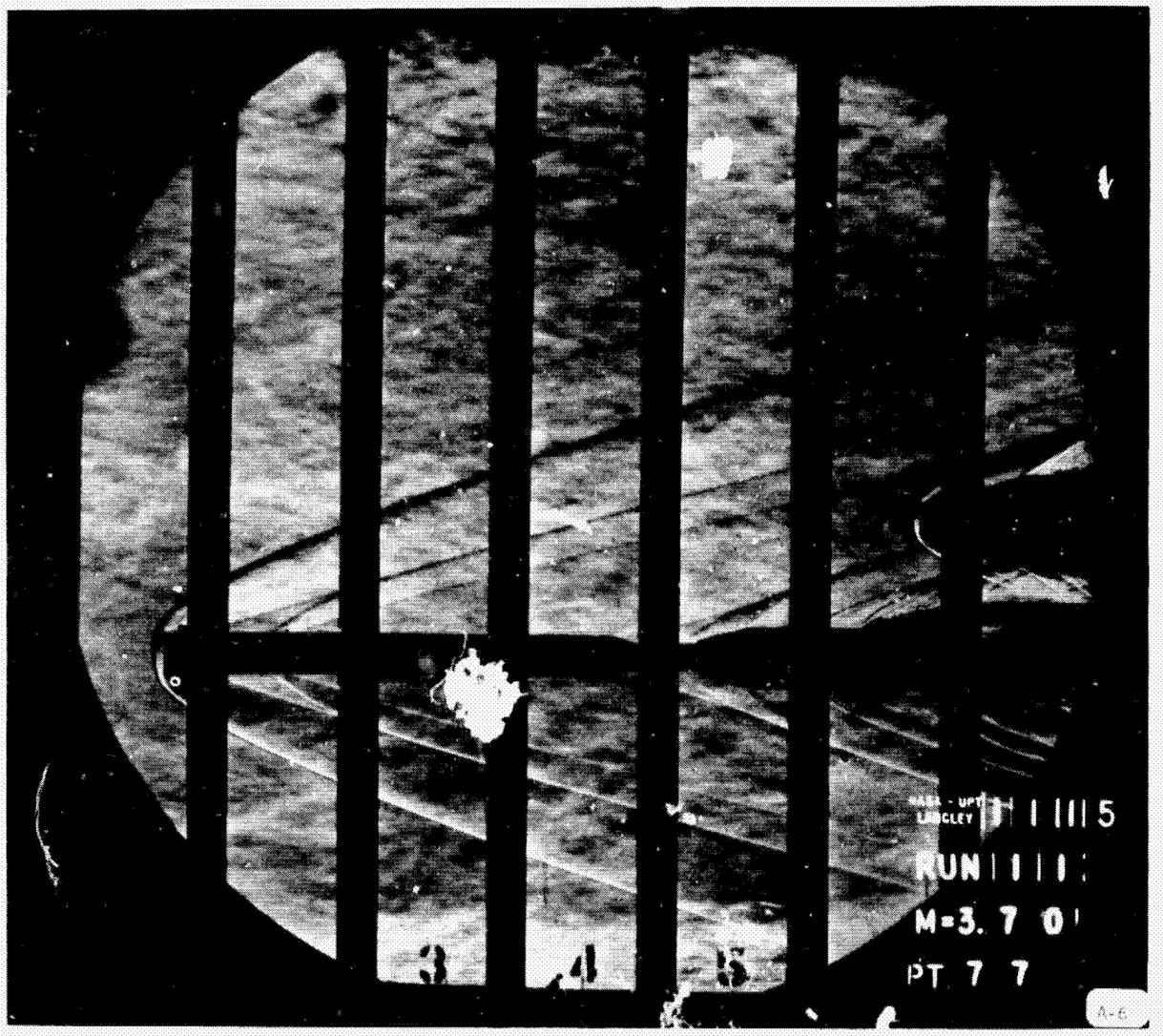
Identification of Schlieren Test Conditions

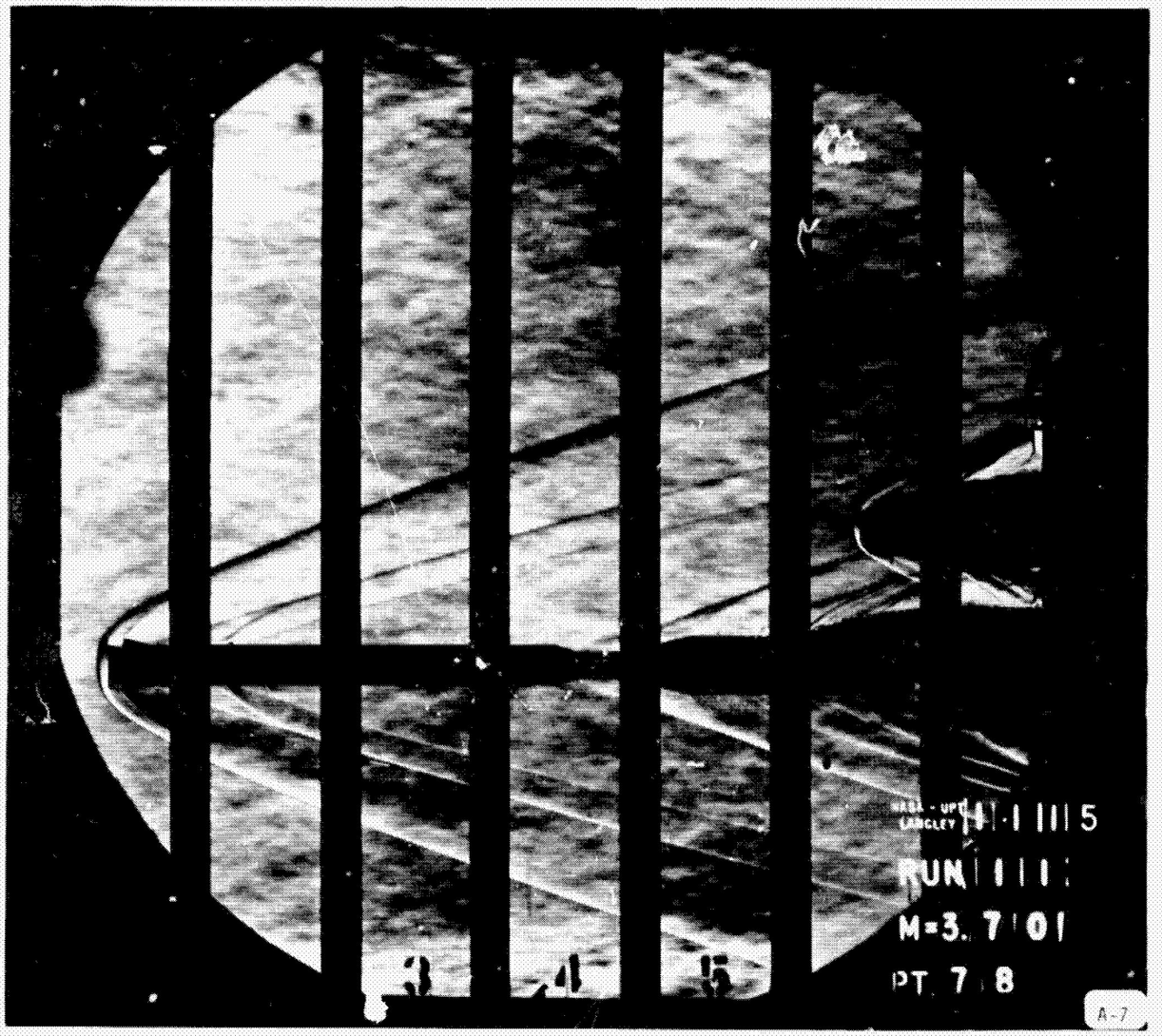
RUN	POINT	CONF.	MACH NO.	RN X 10^{-6}	α(deg)	H_o(psf)	RING	TRIPS	PROTUBERANCE
10	68	B	3.7	3.902	60	6223.7	Yes	No	Θ = 45°
	69	↓	↓	↓	60	↓	↓	↓	↓
	70				75				
	72				90				
11	77	C		3.908	180	6233.5			No
	78	↓		↓	180	↓			↓
	79				170				
	80				170				
	82			3.902	160	6224.0			
12	85			3.902	160	6223.6			
	86			3.908	160	6233.1			
	87			↓	150	↓			
	88				150				
	89			3.902	140	6223.6			
	90	↓		3.908	140	6233.1			
13	93	A		3.904	0	6225.8			
	95	↓		↓	8	↓			
	96				8				
	97				15				
	98				15				
14	100			3.897	30	6215.7			
	101			3.903	30	6225.2			
	102			↓	40	↓			
	103	↓	↓	↓	40	↓	↓	↓	↓

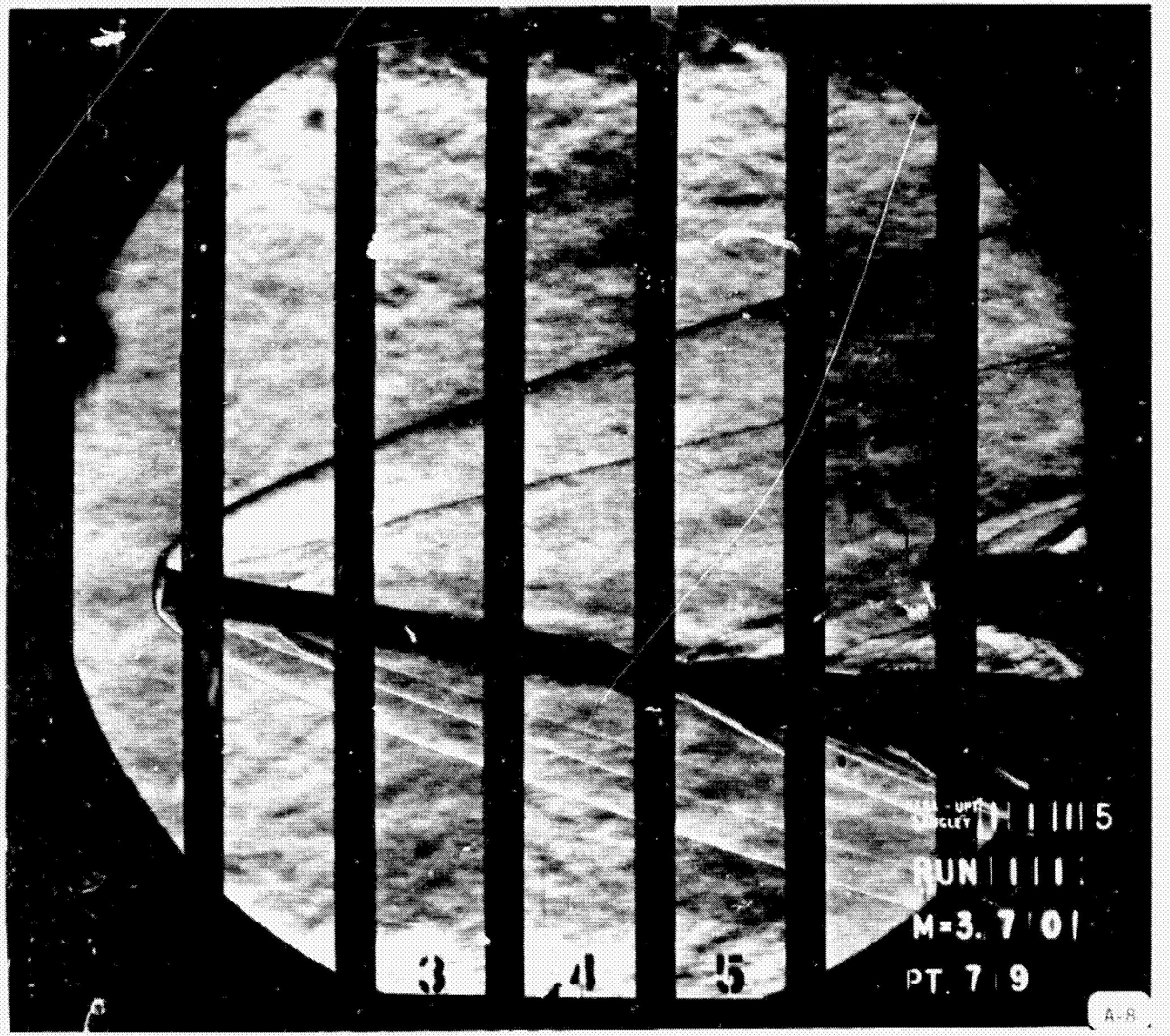


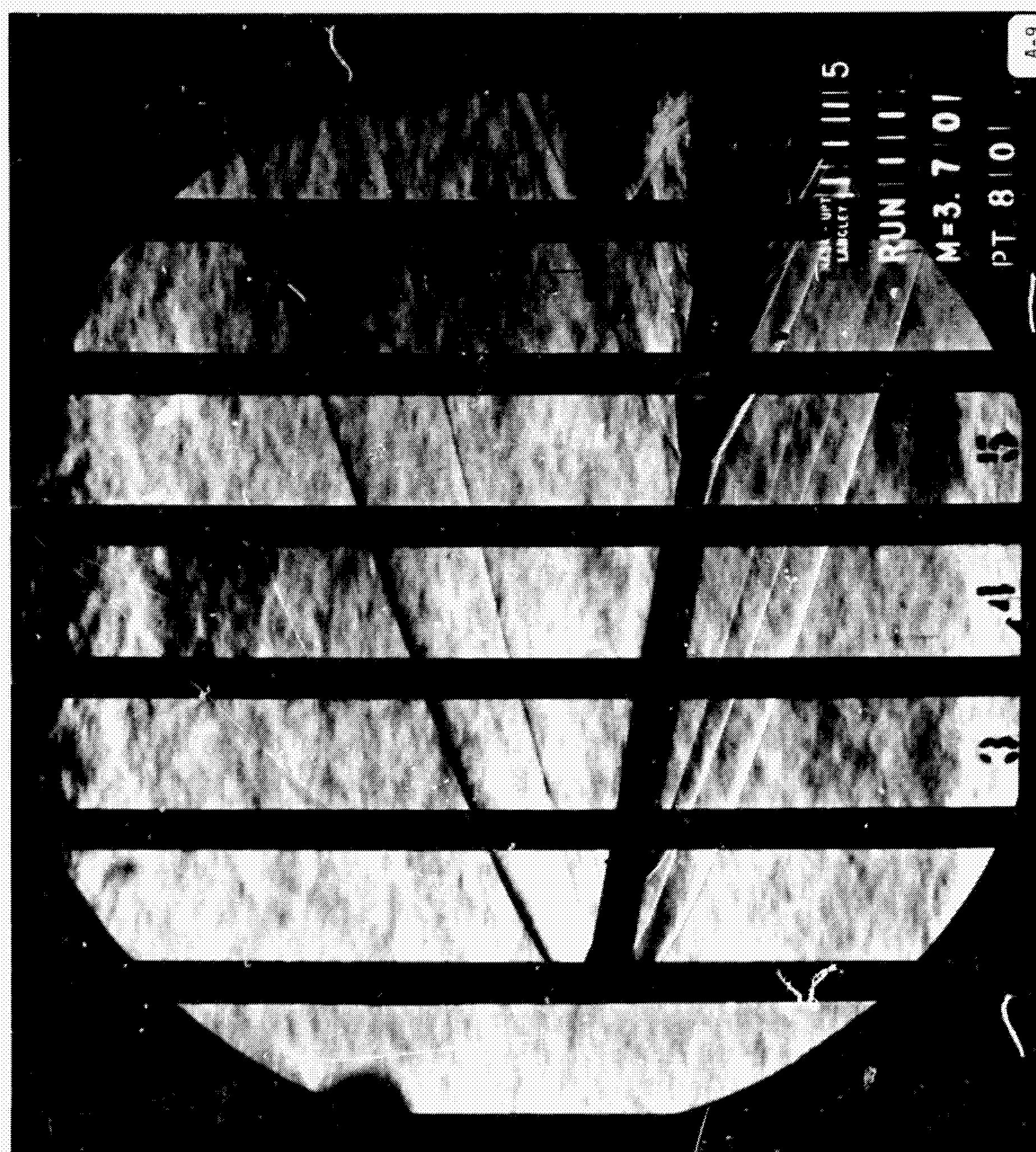

3
4
5
RUN
M=3.7
PT. 7
A-4

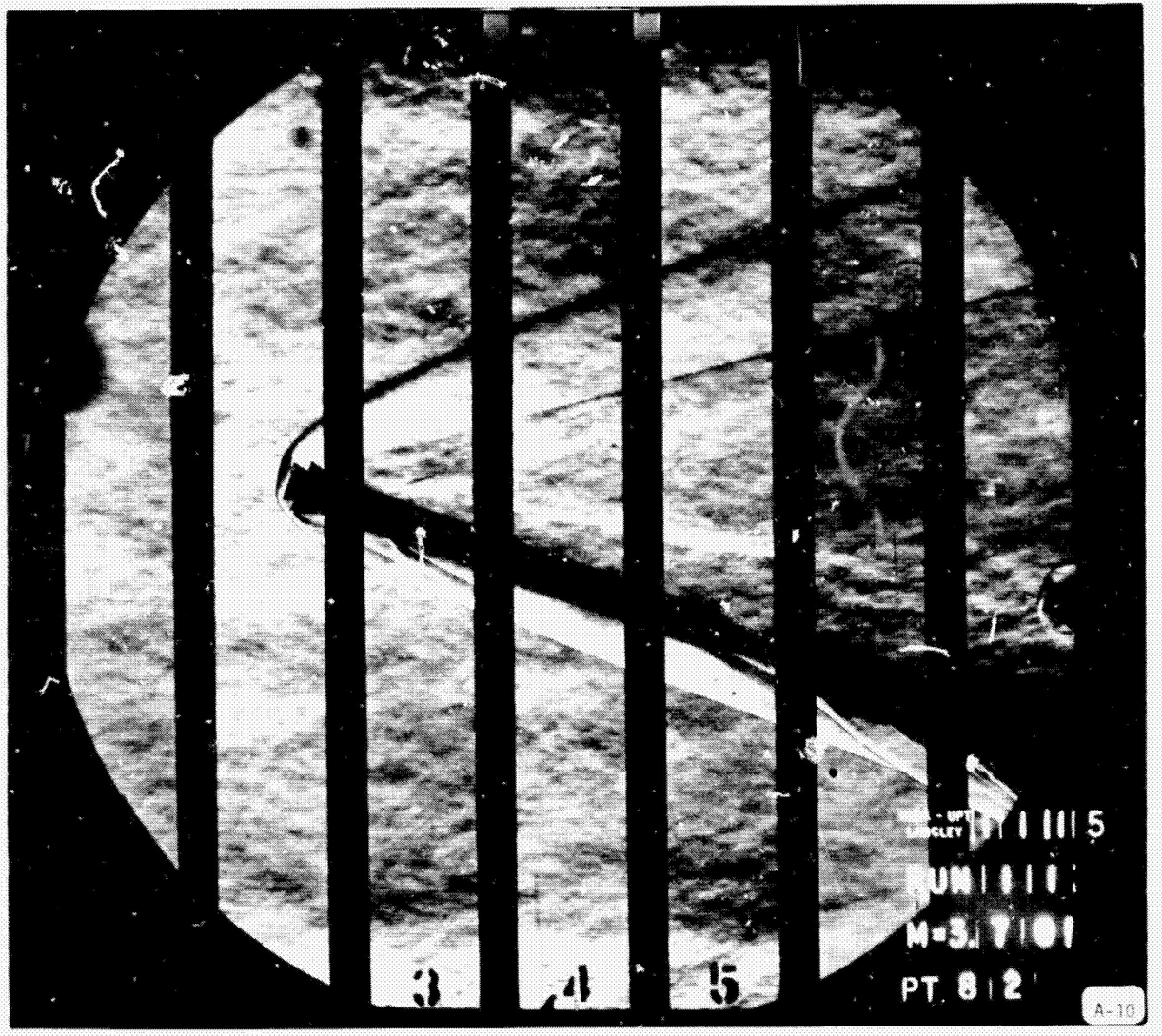

RUN 10
M=3.70
PT 72
A-5

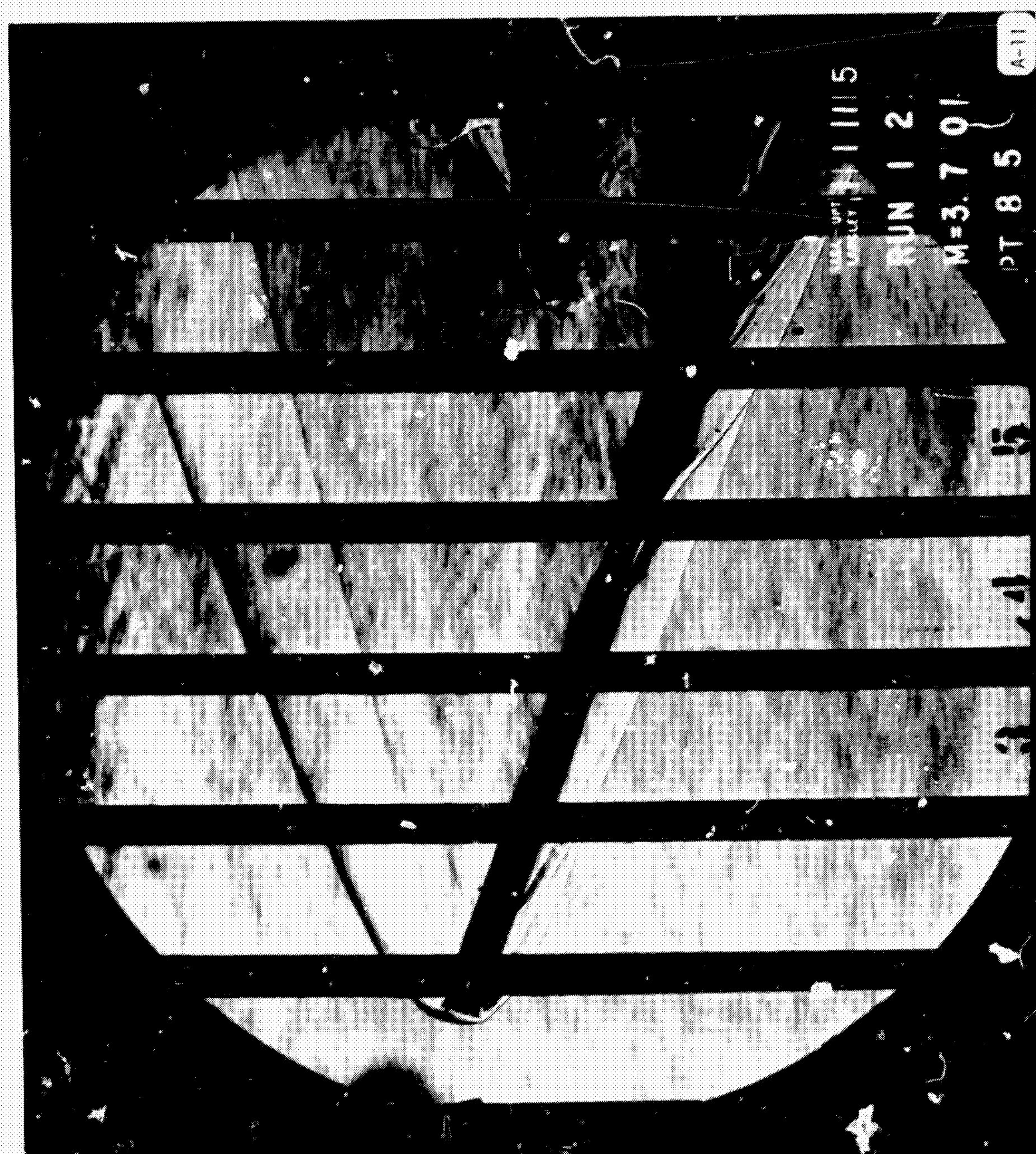

NASA - LRC
LANGLEY
RUN
M=3.7 0
PT 7 7
A-6

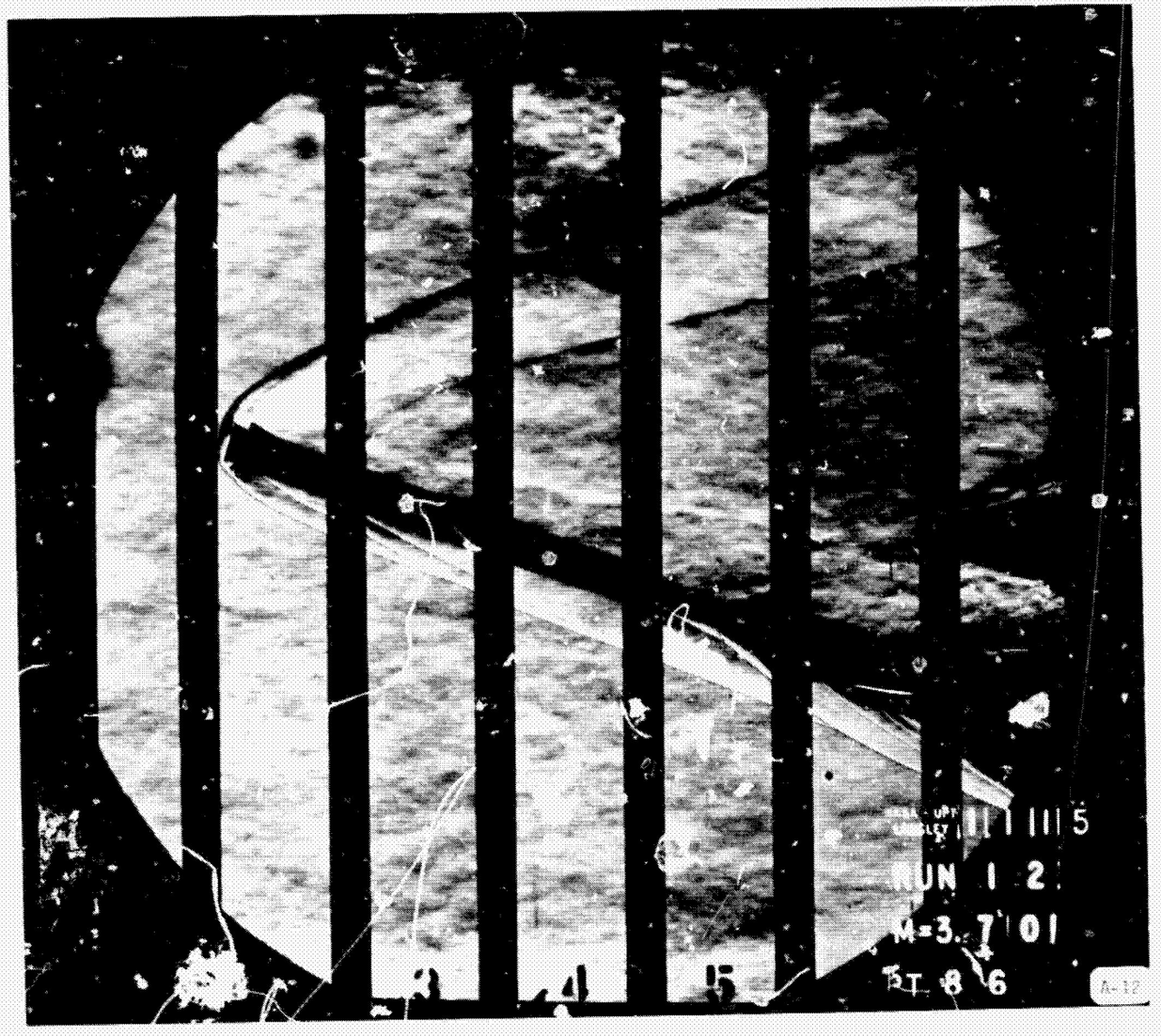

NASA - LRC
LANGLEY
RUN
M=3.7
PT 7 8
A-7

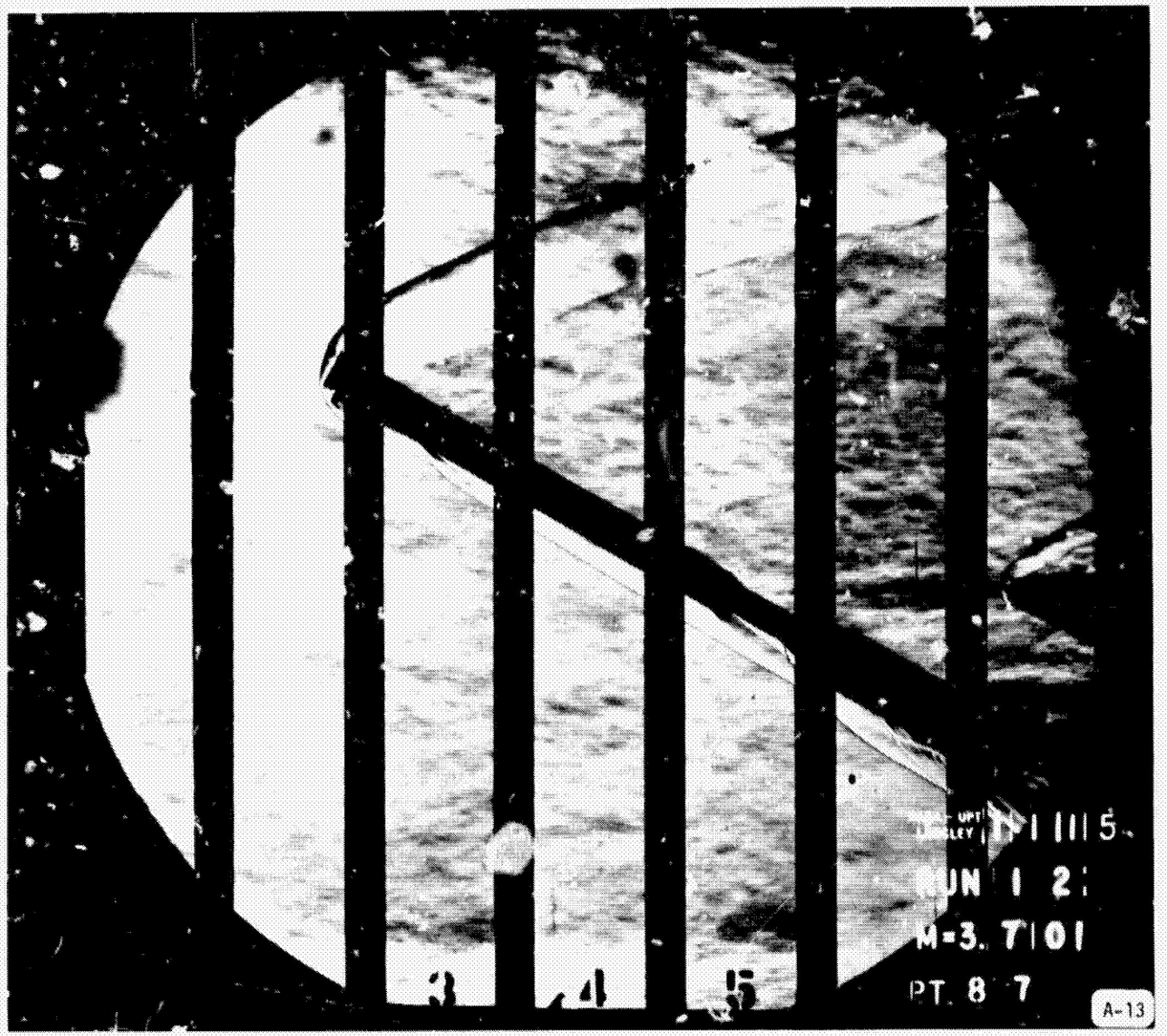

3
4
5
RUN 111
M=3.701
PT. 7 9
A-8



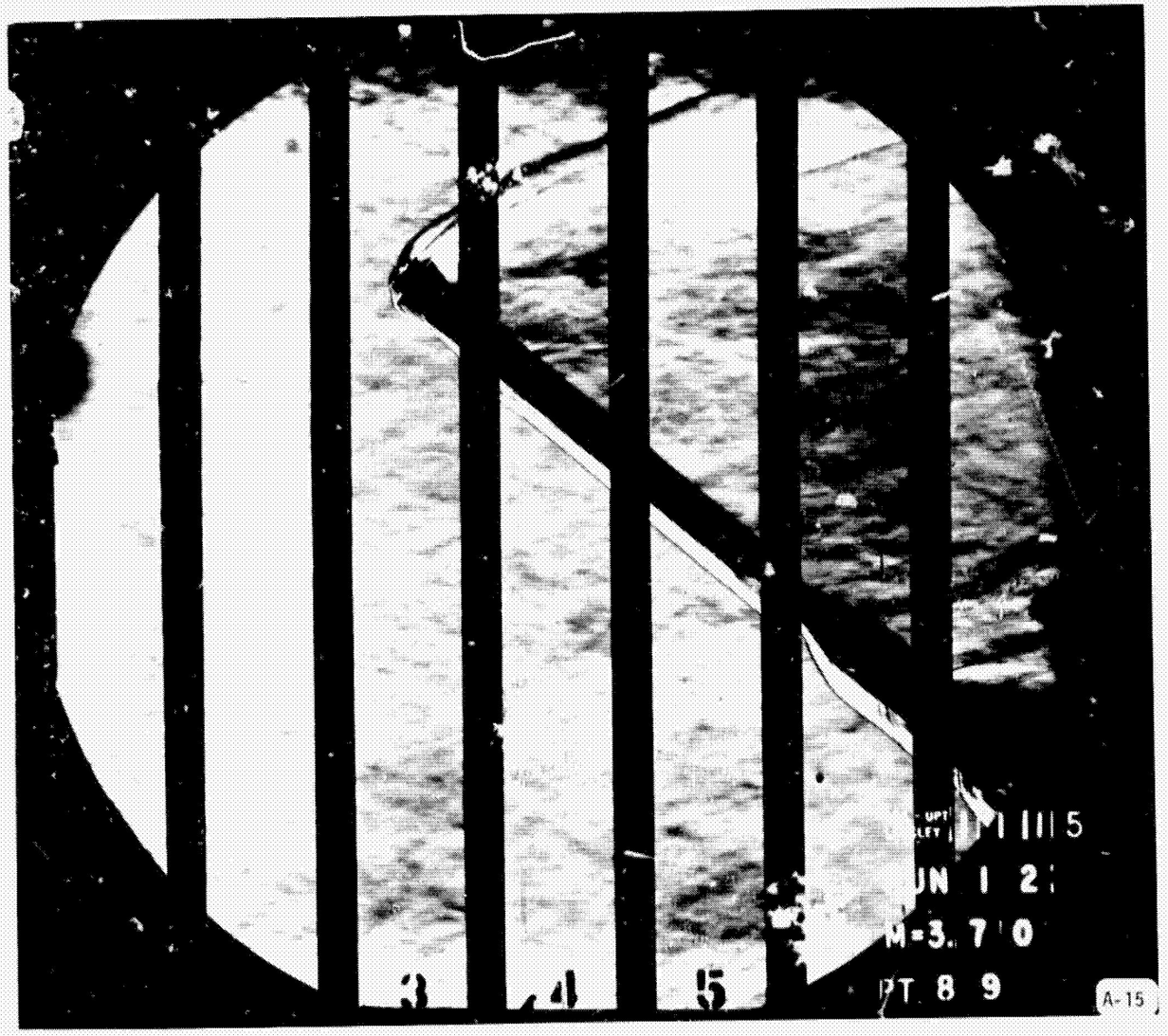

3
4
5
PT. 8 I 2
A-10

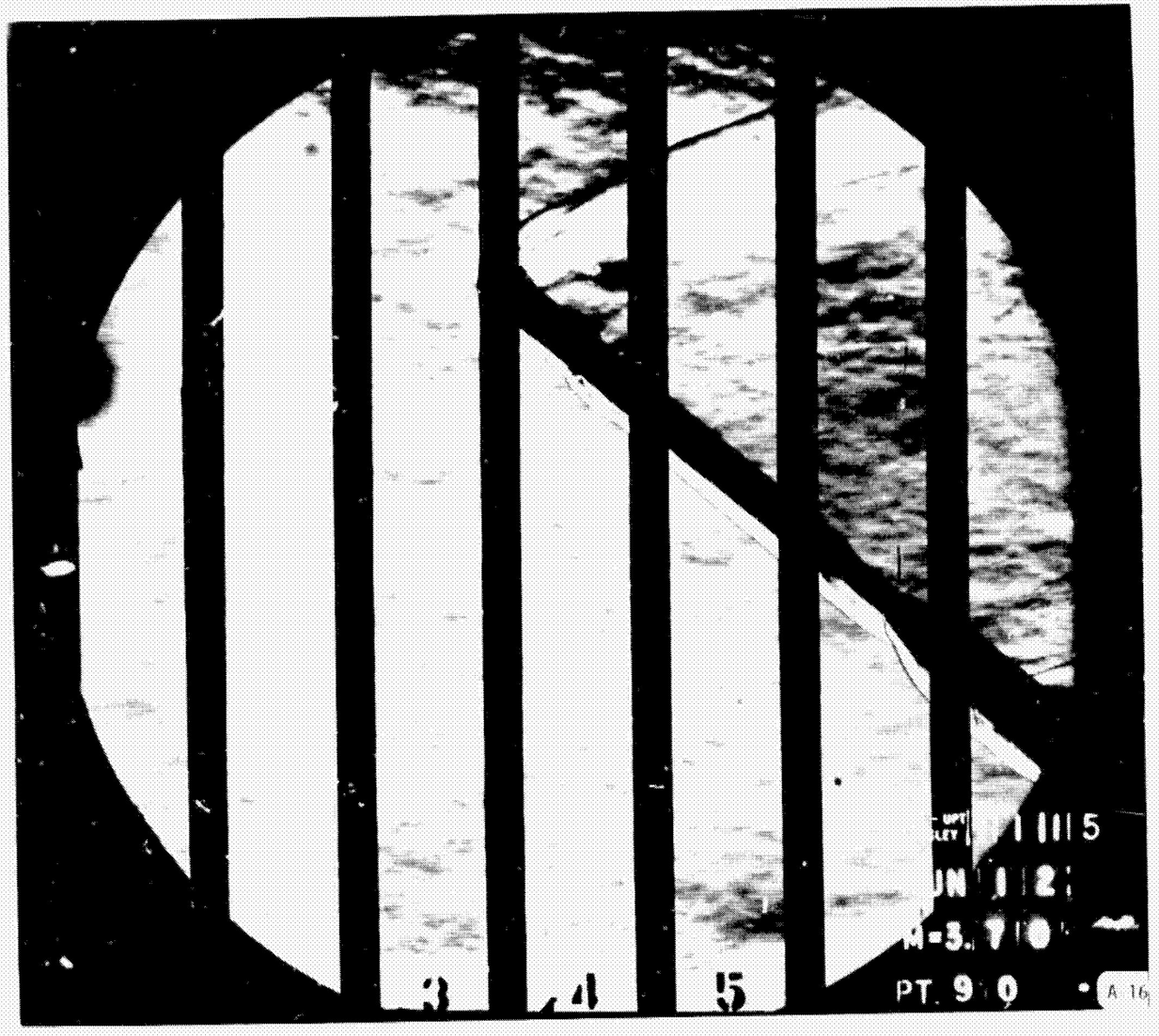


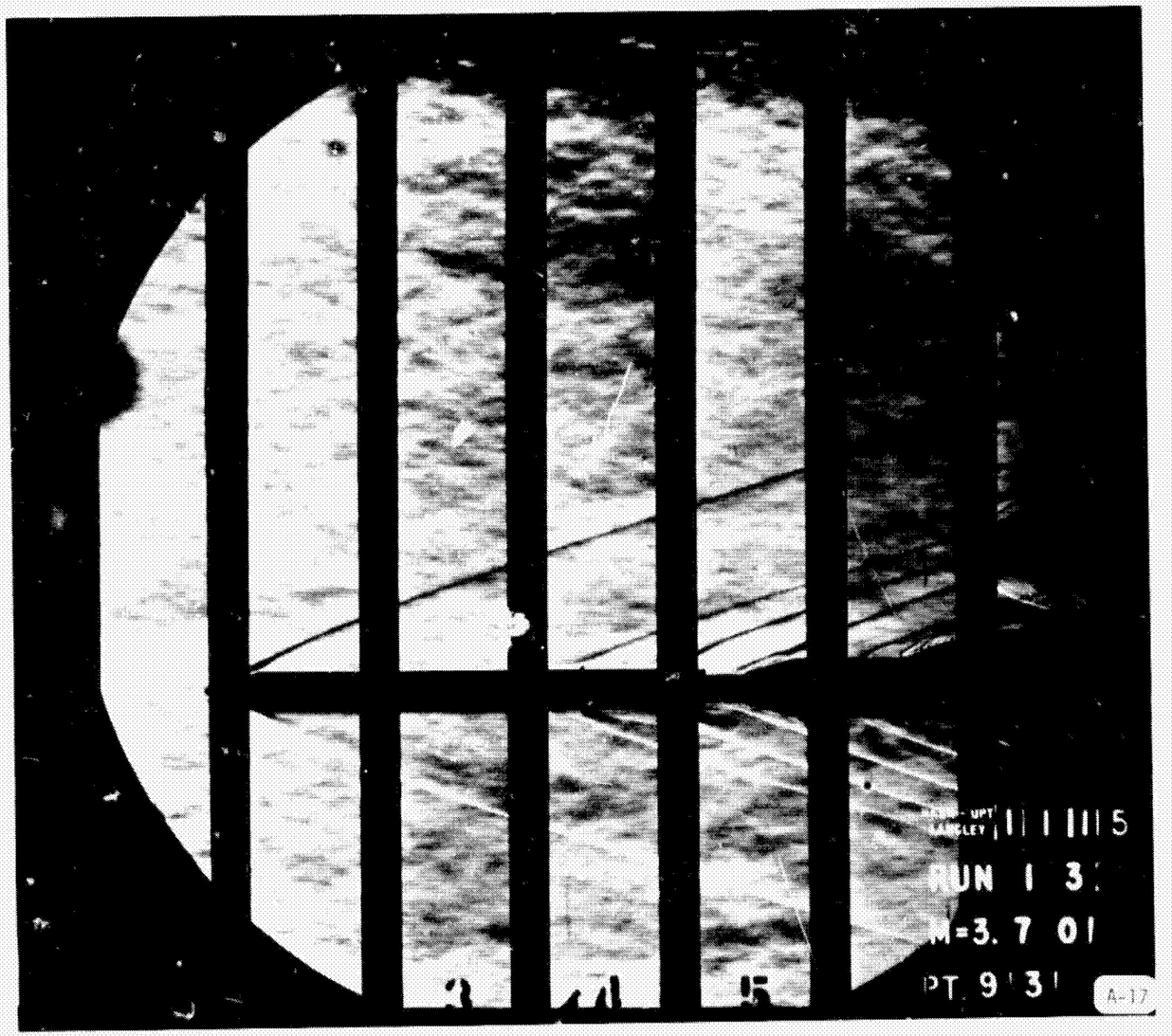

RUN 12
M=3.7 01
RT 8 6
A-12

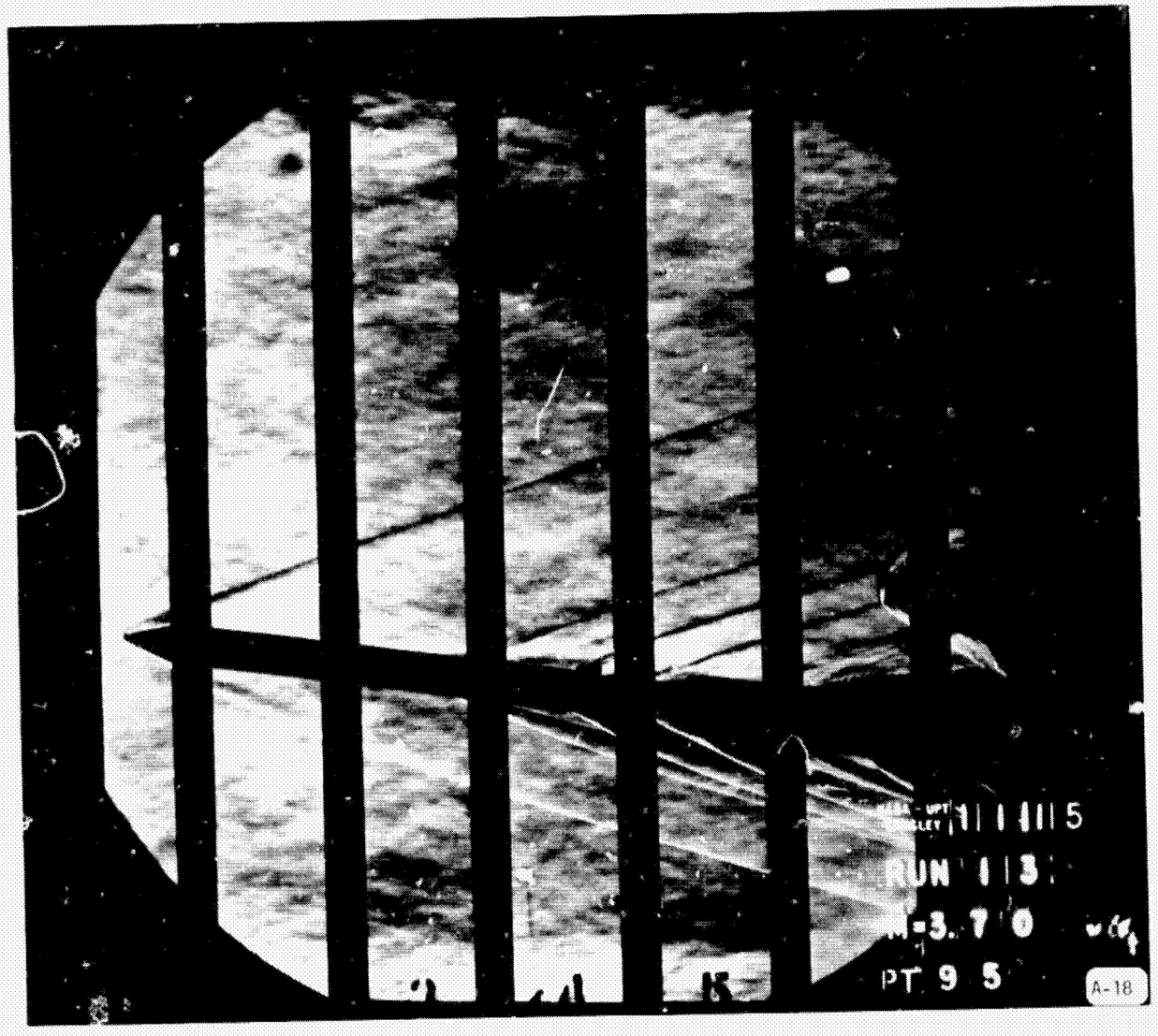

3
4
5
RUN 1 2
M-3. T101
PT. 8 7
A-13

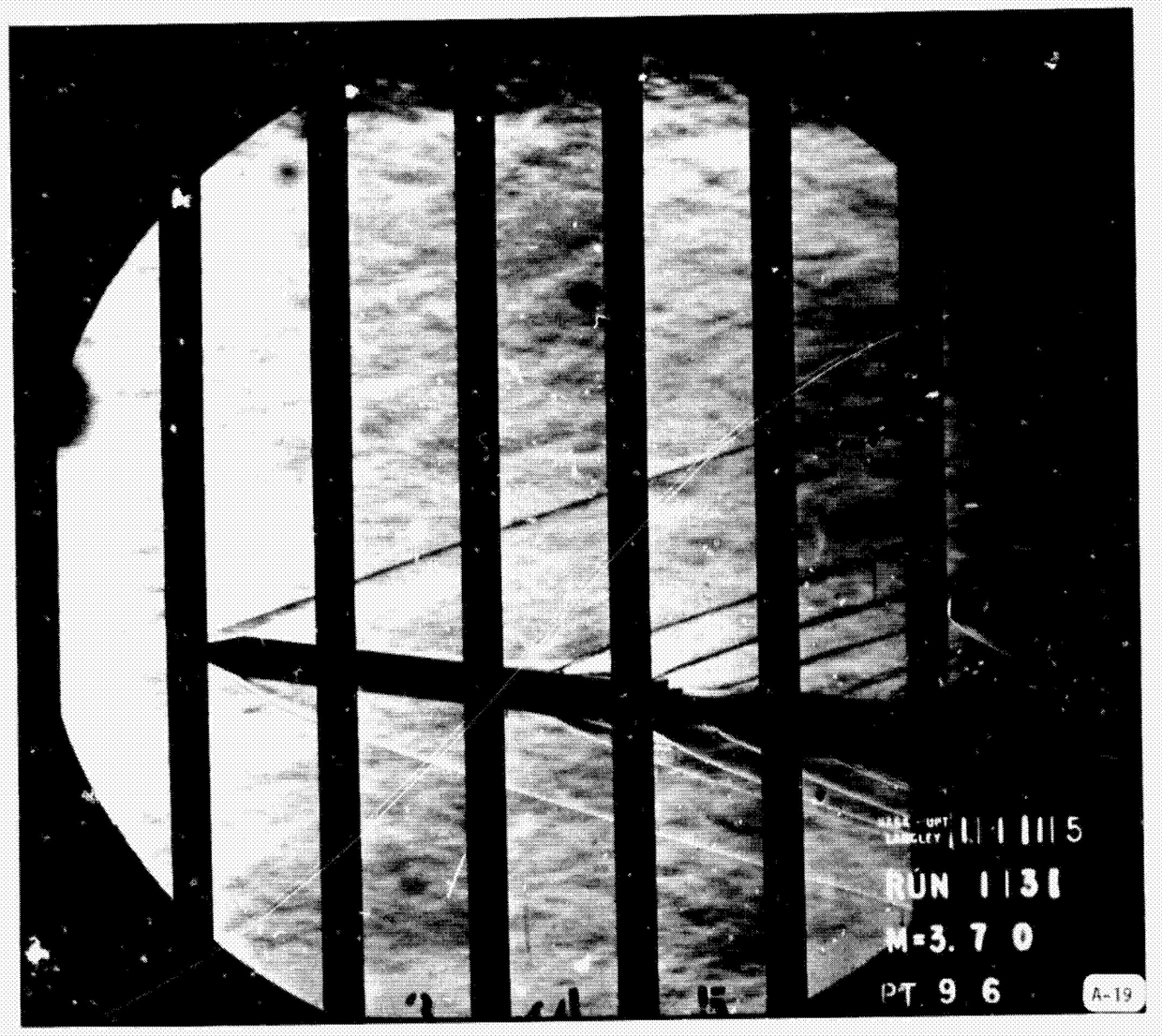

3
4
5
PT. 8 81
A-14

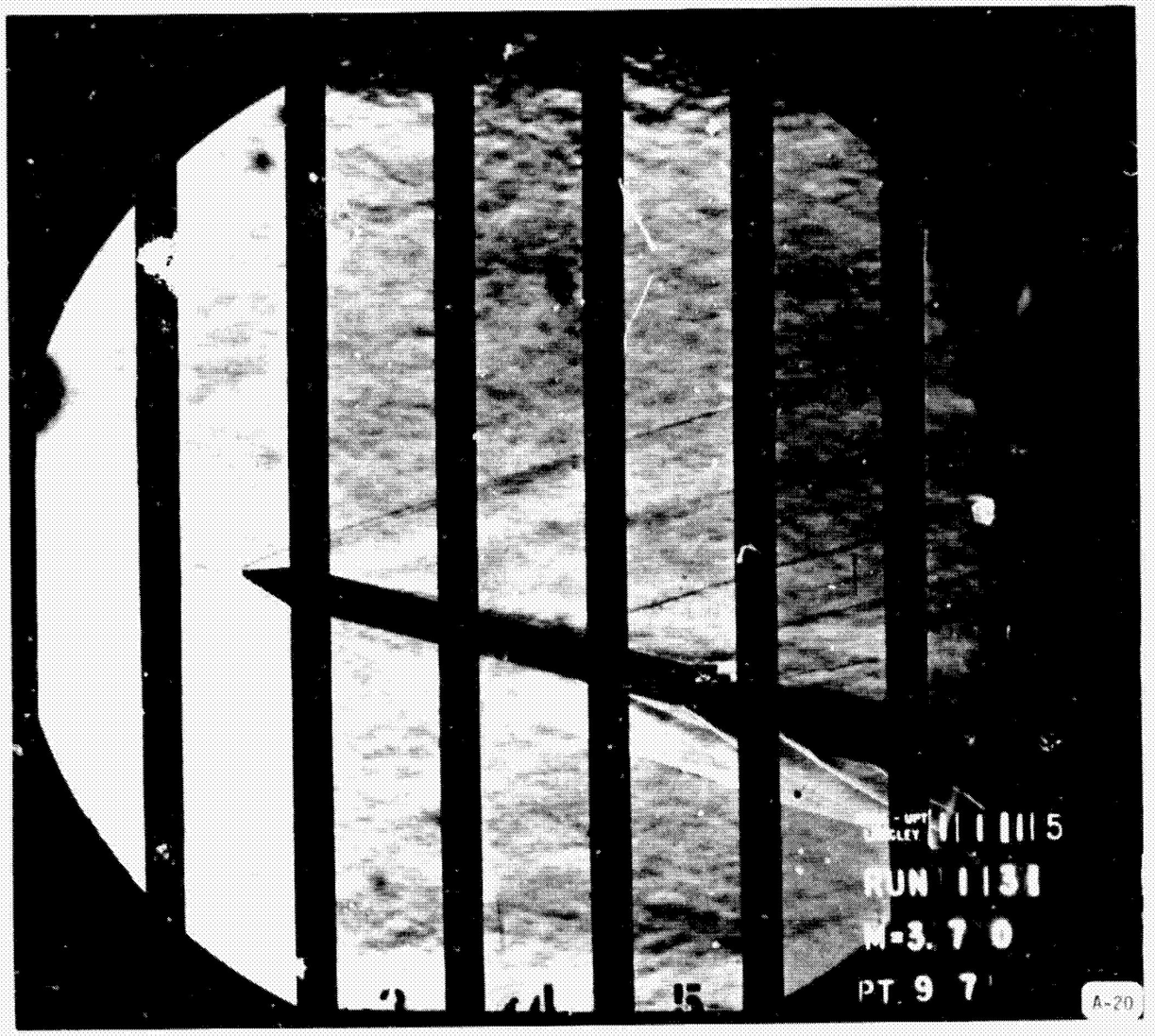

3
4
5
A-15

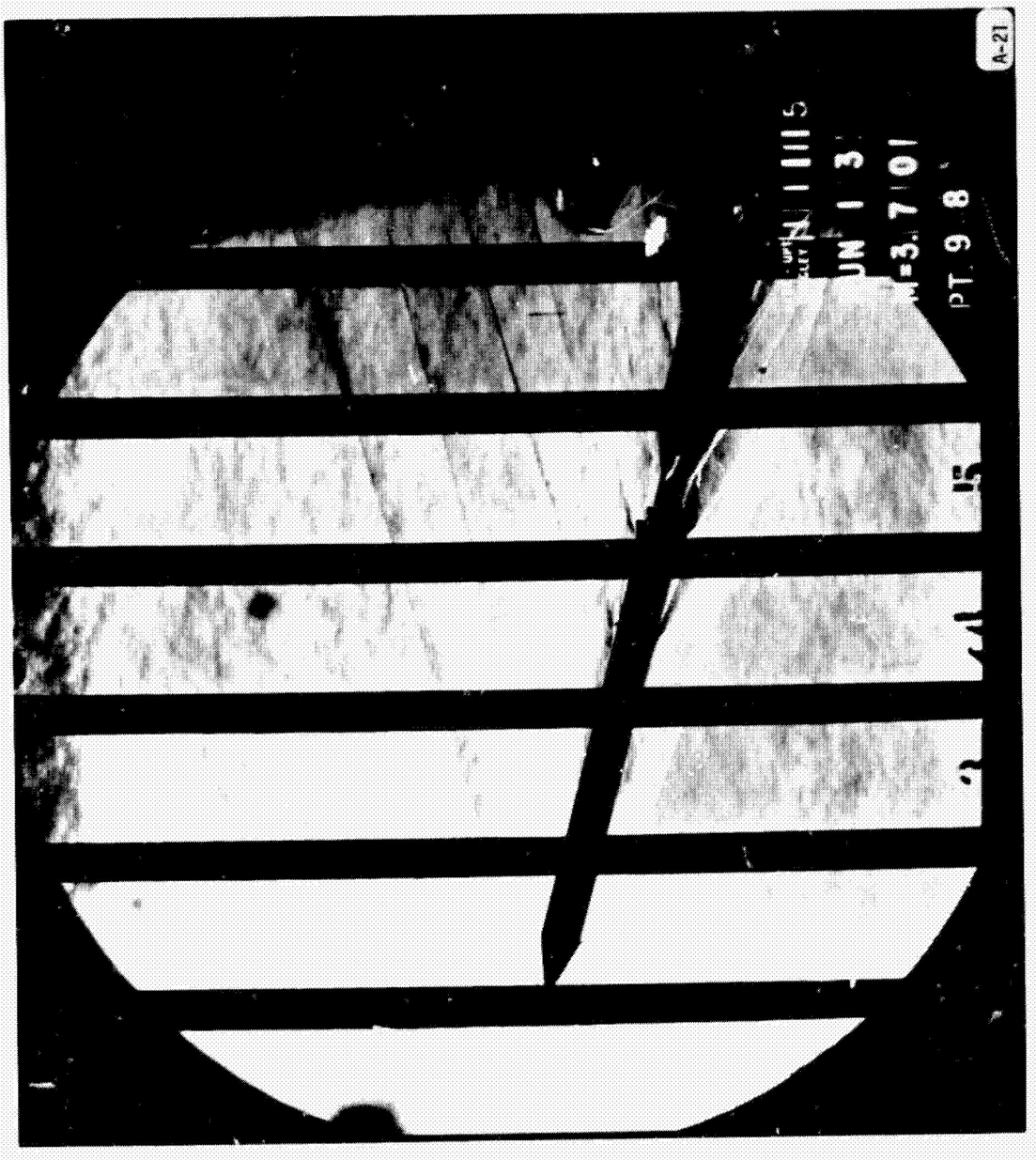

3
4
5
PT. 9 0

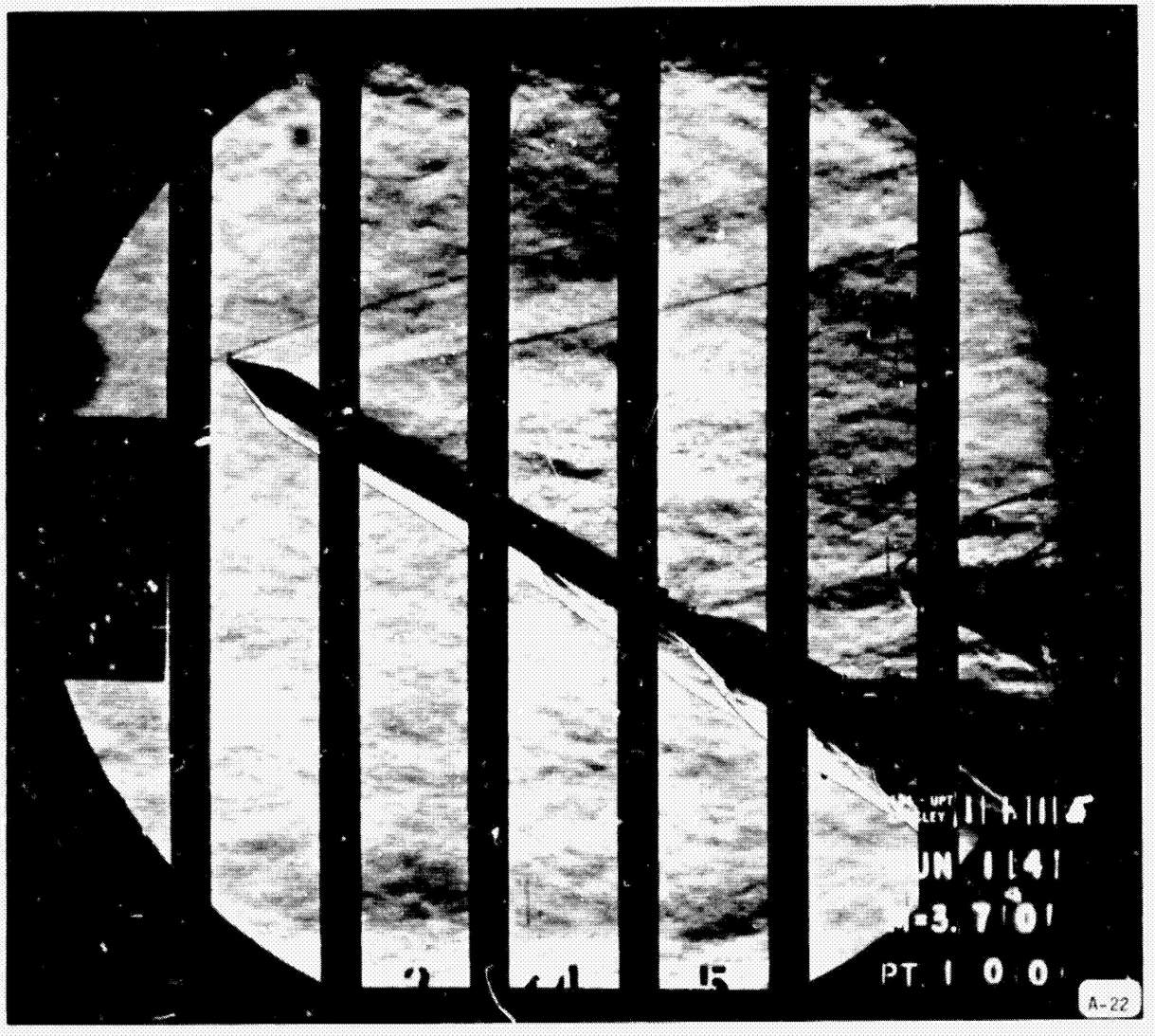

LANGLEY
RUN 1 3
M=3.7 01
PT. 9 3
A-17

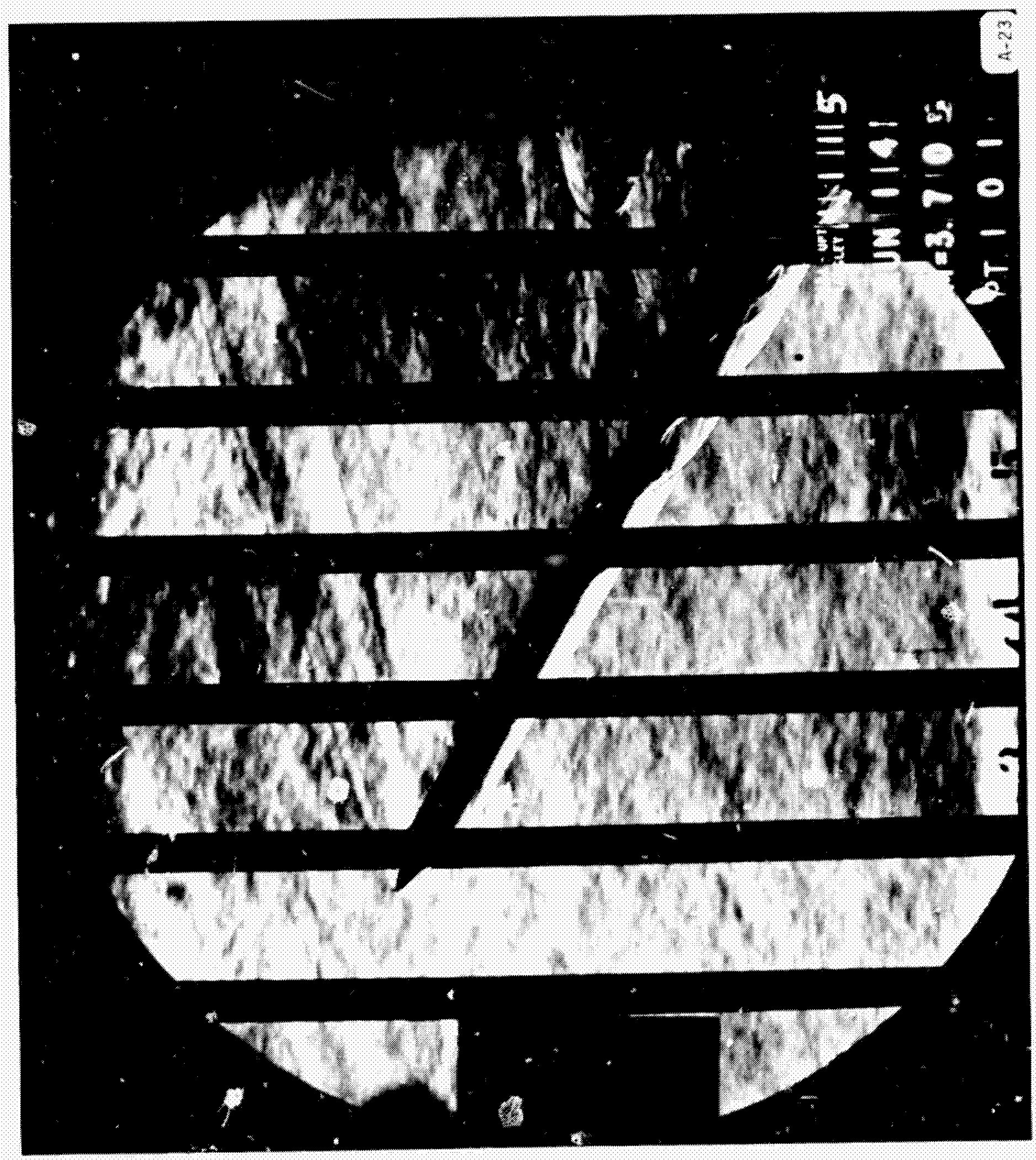

PT 9 5
A-18


NASA - LRC
LANGLEY
1 1 1 1 1 1 5
RUN 1131
M=3.70
PT 9 6
A-19

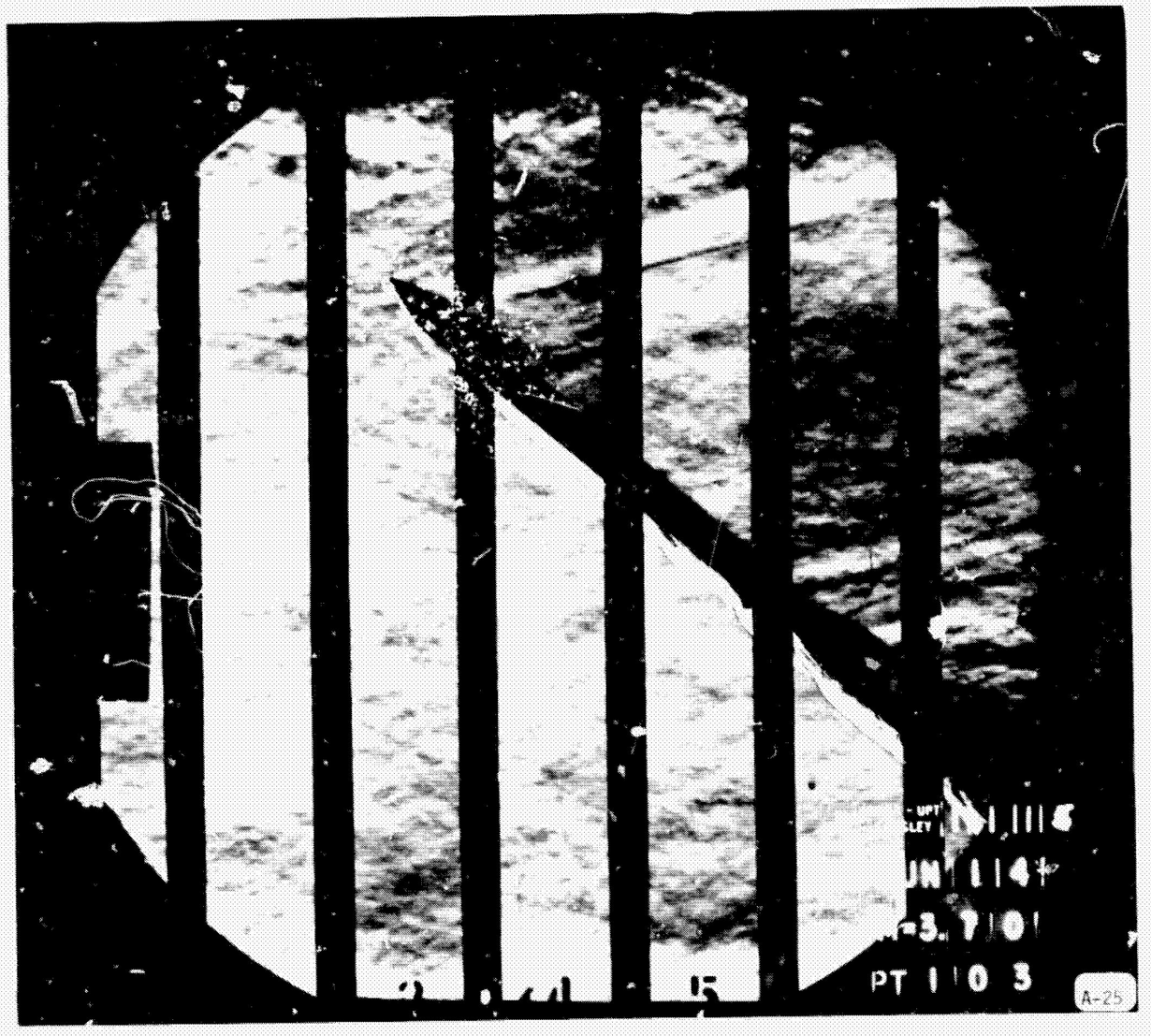

RUN 1131
M=3.70
PT. 9 7
A-20




PT. 1 0 0
A-22




PT 1 0 2
A-24


PT 1 1 0 3
A-25

APPENDIX B

TABULATED DATA

Tabulations of plotted data are available on request
from Data Management Services

LARC UPWT 1115 (SH-12F), SRB WITH B.L. TRIP (RHA001) (08 JUN 75)

REFERENCE DATA

SREF = 15838.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 1.000

ALPHA (1) = .000 MACH (1) = 3.700 RN/L = 3.477 HREF = .057 PO = 7029.900 TO = 713.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.4206	.4317	.4427	.5382
THETA															
.000		.1782	.2581	.0935	.0343	.0356	.0377	.0373	.0746	.0745	.0729		.0763	.0784	.0733
22.500			.2119				.0381						.0787		
45.000		.1644	.2537	.0981			.0384			.0495			.0782		
67.500			.2681				.0391						.0755		
90.000	.1579	.1689	.2589	.0925			-.9000			.0735			.0772		
112.500			.2630				.0394						.0772		
135.000		.1787	.2184	.1039			.0389			.0729			.0780		
157.500			.2540				.0382						.0671		
180.000		.1742		.1009	.0339	.0355	.0354	.0359	.0731	.0758	.0708	.0707	.0736	.0761	.0703

X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0778	.0783	.0951	.1370	.1318	.0651	.1006	.0729	.0688	.0729	.0704	.0548	.0806	.1683	.1844
22.500	.0788														.1753
45.000	.0779				.1184	.0558						.0748		.1740	.1786
67.500	.0778														.1773
90.000	.0781					.0637						.0703		.1682	.1771
112.500	.0754														.1639
135.000	.0759				.1297	.0631						.0691		.1631	.1571
157.500	.0748														.1602
180.000	.0739	.0752	.0900	.1288	.1284	.0601	.0982	.0658	.0688	.0613	.0654	.0579	.0784	.1573	.1629

ALPHA (2) = 8.000 MACH (1) = 3.700 RN/L = 3.386 HREF = .057 PO = 7010.900 TO = 724.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.4206	.4317	.4427	.5382
THETA															
.000		.0790	.1177	.0587	.0207	.0210	.0222	.0215	.0442	.0501	.0485		.0505	.0617	.0808
22.500			.1135				.0177						.0499		
45.000		.1110	.1555	.0699			.0178			.0284			.0420		
67.500			.1943				.0271						.0377		
90.000	.1621	.1808	.2206	.0921			-.9000			.0570			.0541		
112.500			.2821				.0565						.0762		
135.000		.2547	.2049	.1332			.0813			.0922			.0953		
157.500			.3452				.0978						.0988		

C-52

LARC UPWT 1115 (SH-12F), SRB WITH B.L. TRIP (RHA001)

ALPHA (2) = 8.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
180.000		.2737		.1478	.0799	.0854	.1008	.1116	.1053	.1124	.1045	.1051	.1128	.1159	.1054
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	8837	.8947	.9058	.9278	.9499
THETA															
.000	.0653	.0858	.0897	.1483	.1740	.0697	0725	.0810	.0787	.0804	.0787	.0652	.0979	.2198	.2760
22.500	.0524														.1467
45.000	.0403				.0751	.0494						.0598		.1177	.0909
67.500	.0389														.1223
90.000	.0487					.0387						.0554		.1487	.1713
112.500	.0724														.1942
135.000	.0943				.1787	.0753						.0949		.2414	.2368
157.500	.1095														.2791
180.000	.1128	.1155	.1285	.1938	.2187	.0972	.1097	.1097	.1159	.1080	.1142	.1008	.1316	.2900	.2940

ALPHA (3) = 15.000 MACH (1) = 3.700 RN/L = 3.472 HREF = .057 PO = 7029.900 TO = 715.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0535	.0859	.0397	.0321	.0344	.0398	.0426	.0467	.0582	.0547		.0813	.0830	.0542
22.500			.0762				.0225						.0431		
45.000		.0977	.1202	.0519			.0138			.0172			.0329		
67.500			.1802				.0275						.0238		
90.000	.1059	.2119	.2458	.0935			-.9000			.0455			.0441		
112.500			.3381				.0875						.0838		
135.000		.3475	.3383	.1686			.1359			.1158			.1237		
157.500			.4706				.1770						.1374		
180.000		.3903		.1988	.1490	.1562	.1771	.1813	.1492	.1586	.1494	.1532	.1635	.1884	.1573
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0588	.0605	.0888	.1376	.1528	.0526	.0478	.0783	.0654	.0620	.0545	.0412	.0391	.1587	.1804
22.500	.0430														.1459
45.000	.0348				.0855	.0421						.0485		.1044	.0827
67.500	.0285														.0929
90.000	.0430					.0368						.0457		.1302	.1522
112.500	.0826														.2383
135.000	.1265				.2358	.1107						.1354		.3498	.3312
157.500	.1607														.4189
180.000	.1699	.1745	.1912	.2860	.3209	.1505	.1870	.1714	.1826	.1648	.1768	.1578	.2049	.4498	.4452

LARC UPWT 1115 (SH-12F), SRB HO/BL TRIP AND RING (RHA002) (06 JUN 75)

REFERENCE DATA

SREF = 15838.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 1.000

ALPHA (1) = 30.000 MACH (1) = 3.700 RN/L = 3.416 HREF = .057 PO = 6983.200 TO = 719.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0703	.0842	.0322	.0177	.0186	.0195	.0204	.0288	.0295	.0245		.0323	.0330	.0263
22.500			.0424				.0246						.0259		
45.000		.0750	.0450	.0219			.0164			.0134			.0195		
67.500			.0778				.0237						.0183		
90.000	.2249	.1703	.1230	.0859			-.9000			.0353			.0377		
112.500			.1846				.0800						.0744		
135.000		.3117	.2053	.1599			.1143			.1021			.1105		
157.500			.2871				.1388						.1250		
180.000		.3742		.2048	.1248	.1029	.1392	.1414	.1298	.1449	.1356	.1322	.1460	.1527	.1313
X/L	.5412	.5523	.7246	.7357	.7467	.7686	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9489
THETA															
.000	.0284	.0276	.0238	.0234	.0220	.0226	.0224	.0213	.0201	.0203	.0191	.0149	.0192	.0414	.0487
22.500	.0233														.0408
45.000	.0179				.0134	.0127						.0162		.0339	.0378
67.500	.0196														.0829
90.000	.0404					.0357						.0477		.1711	.1935
112.500	.0746														.3362
135.000	.1111				.0985	.0957						.2030		.5885	.5079
157.500	.1407														.6850
180.000	.1484	.1529	.1265	.1358	.1424	.1572	.1551	.2979	.3379	.3068	.3432	.2980	.4007	.7812	.7571

ALPHA (2) = 35.000 MACH (1) = 3.700 RN/L = 3.488 HREF = .057 PO = 7011.700 TO = 714.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0636	.0567	.0290	.0199	.0209	.0235	.0226	.0244	.0266	.0231		.0229	.0231	.0206
22.500			.0390				.0240						.0208		
45.000		.0786	.0436	.0206			.0174			.0136			.0168		
67.500			.0777				.0265						.0199		
90.000	.2389	.1750	.1297	.0744			-.9000			.0423			.0451		
112.500			.2020				.0918						.0867		
135.000		.3297	.2852	.1886			.1347			.1212			.1268		
157.500			.3205				.1636						.1437		

LARC UPWT 1115 (SM-12F), SRB HO/BL TRIP AND RING (RHA002)

ALPHA (2) = 35.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
180.000		.3999		.2422	.1451	.1191	.1662	.1687	.1445	.1694	.1546	.1496	.1660	.1742	.1472

X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0214	.0210	.0158	.0154	.0147	.0158	.0148	.0132	.0134	.0119	.0109	.0082	.0115	.0253	.0298
22.500	.0185														.0267
45.000	.0148				.0125	.0117						.0111		.0322	.0324
67.500	.0220														.0875
90.000	.0475					.0386						.0830		.2163	.1960
112.500	.0881														.3528
135.000	.1257				.1124	.1104						.2788		.6419	.5526
157.500	.1568														.7684
180.000	.1849	.1737	.1410	.1531	.1613	.1832	.1741	.3501	.3933	.3816	.4017	.3491	.4717	.8896	.8571

ALPHA (3) = 40.000 MACH (1) = 3.700 RN/L = 3.545 HREF = .057 PO = 7011.700 TO = 704.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0605	.0803	.0279	.0185	.0205	.0837	.0267	.0202	.0219	.0193		.0210	.0203	.0180
22.500			.0366				.0223						.0184		
45.000		.0714	.0392	.0192			.0161			.0123			.0154		
67.500			.0756				.0277						.0223		
90.000	.2509	.1839	.1343	.0755			-.9000			.0499			.0537		
112.500			.2158				.1092						.1036		
135.000		.3714	.2484	.2008			.1662			.1462			.1519		
157.500			.3579				.2068						.1710		
180.000		.4639		.2853	.1802	.1515	.2101	.2183	.1946	.2087	.1988	.1826	.2019	.2112	.1752

X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0198	.0192	.0189	.0107	.0108	.0117	.0107	.0084	.0078	.0078	.0085	.0104	.0179	.0275	.0248
22.500	.0178														.0221
45.000	.0184				.0110	.0102						.0140		.0327	.0256
67.500	.0249														.0803
90.000	.0523					.0456						.0839		.2129	.2023
112.500	.0982														.3816
135.000	.1481				.1323	.1305						.3415		.7448	.6174
157.500	.1884														.8852
180.000	.1991	.2063	.1784	.1860	.1963	.2350	.2328	.4467	.4989	.4277	.4881	.4167	.5898	1.0990	.9987

LARC UPWT 1115 (SH-12F), SRB WO/BL TRIP AND RING (RHA003) (08 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 1.000

ALPHA (1) = 30.000 MACH (1) = 3.700 RN/L = 3.499 MREF = .057 PO = 7021.200 TO = 708.000

SECTION (11SRB (AFT STING MT) DEPENDENT VARIABLE M/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3887	.4208	.4317	.4427	.5382
THETA															
.000		.0716	.0822	.0330	.0176	.0190	.0209	.0212	.0278	.0294	.0262		.0348	.0343	.0283
22.500			.0436				.0244						.0286		
45.000		.0783	.0463	.0232			.0169			.0139			.0208		
67.500			.0781				.0240						.0199		
90.000	.2265	.1708	.1237	.0884			-.9000			.0360			.0394		
112.500			.1840				.0787						.0759		
135.000		.3098	.2032	.1612			.1136			.1016			.1106		
157.500			.2831				.1362						.1260		
180.000		.3700		.2067	.1198	.1006	.1370	.1377	.1244	.1420	.1334	.1316	.1459	.1521	.1309

X/L	.5412	.5523	.7246	.7357	.7467	.7668	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0309	.0301	.0249	.0254	.0235	.0239	.0230	.0224	.0216	.0222	.0210	.0171	.0211	.0425	.0500
22.500	.0258														.0420
45.000	.0190				.0141	.0135						.0139		.0375	.0407
67.500	.0208														.0909
90.000	.0412					.0385						.0491		.1804	.2000
112.500	.0747														.3483
135.000	.1122				.1005	.0974						.2070		.6132	.5284
157.500	.1402														.7228
180.000	.1478	.1535	.1281	.1382	.1428	.1559	.1516	.3002	.3415	.3148	.3487	.3078	.4143	.8212	.8037

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA004) (08 JUN 75)

REFERENCE DATA

SREF = 15836.8600 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 1.500
MODEL = 1.000

ALPHA (1) = .000 MACH (1) = 3.700 RN/L = 1.527 HREF = .037 PO = 3022.100 TO = 704.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.1144	.0986	.0529	.0222	.0220	.0233	.0206	.0142	.0137	.0139		.0149	.0185	.0137
22.500			.0878				.0240						.0149		
45.000		.1202	.1059	.0543			.0258			.0091			.0155		
67.500			.1074				.0254						.0143		
90.000	.1957	.1187	.1023	.0510			.0155			.0149			.0148		
112.500			.1054				.0242						.0147		
135.000		.1212	.0918	.0577			.0247			.0141			.0136		
157.500			.1025				.0238						.0125		
180.000		.1184		.0569	.0229	.0221	.0215	.0207	.0129	.0140	.0126	.0123	.0130	.0136	.0122

X/L	.5412	.5523	.7246	.7357	.7467	.7686	.7776	.8505	.8616	.8728	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0133	.0134	.0152	.0183	.0162	.0150	.0109	.0358	.0379	.0392	.0406	.0328	.0562	.1473	.2893
22.500	.0138														.2075
45.000	.0136				.0195	.0140						.0381		.1397	.2148
67.500	.0138														.2067
90.000	.0130					.0152						.0373		.1391	.2154
112.500	.0128														.1996
135.000	.0116				.0155	.0156						.0438		.1438	.1930
157.500	.0125														.1972
180.000	.0121	.0125	.0147	.0184	.0144	.0169	.0135	.0328	.0357	.0360	.0400	.0355	.0516	.1414	.1985

ALPHA (2) = 8.000 MACH (1) = 3.700 RN/L = 1.589 HREF = .037 PO = 3025.000 TO = 704.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0855	.0418	.0244	.0088	.0083	.0082	.0084	.0221	.0315	.0303		.0438	.0483	.0519
22.500			.0478				.0088						.0288		
45.000		.0882	.0720	.0407			.0123			.0058			.0128		
67.500			.0821				.0208						.0116		
90.000	.1618	.1270	.1081	.0549			.0191			.0242			.0221		
112.500			.1285				.0377						.0343		
135.000		.1875	.1237	.0798			.0452			.0389			.0422		
157.500			.1441				.0500						.0440		

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA004)

ALPHA (2) = 8.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE M/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
180.000		.1768		.0884	.0432	.0441	.0479	.0478	.0420	.0475	.0408	.0428	.0475	.0492	.0443
X/L	.5412	.5523	.7248	.7357	.7467	.7886	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9498
THETA															
.000	.0571	.0581	.0892	.1291	.1423	.0748	.0614	.0472	.0497	.0506	.0536	.0488	.0775	.1612	.1778
22.500	.0388														.1351
45.000	.0192				.0483	.0312						.0659		.1160	.1050
67.500	.0125														.1173
90.000	.0189					.0184						.0513		.1289	.1568
112.500	.0329														.1773
135.000	.0424				.0979	.0419						.0761		.2061	.2082
157.5	.0476														.2381
180.000	.0494	.0489	.0858	.1209	.1350	.0854	.0572	.0851	.0890	.0819	.0881	.0812	.1056	.2424	.2465

ALPHA (3) = 15.000 MACH (1) = 3.700 RN/L = 1.542 MREF = .037 PO = 2996.500 TO = 695.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE M/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0588	.0397	.0260	.0259	.0292	.0348	.0380	.0374	.0463	.0424		.0516	.0492	.0447
22.500			.0440				.0195						.0358		
45.000		.0886	.0680	.0395			.0133			.0158			.0218		
67.500			.0977				.0247						.0185		
90.000	.1988	.1589	.1238	.0888			.0283			.0296			.0305		
112.500			.1576				.0554						.0480		
135.000		.2345	.1818	.1119			.0705			.0569			.0637		
157.500			.1980				.0803						.0780		
180.000		.2590		.1297	.0709	.0715	.0800	.0794	.0851	.0724	.0848	.0890	.0762	.0774	.0719
X/L	.5412	.5523	.7248	.7357	.7467	.7886	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9498
THETA															
.000	.0518	.0518	.0714	.0972	.1043	.0586	.0466	.0440	.0405	.0355	.0304	.0248	.0339	.0884	.1719
22.500	.0384														.1427
45.000	.0191				.0424	.0230						.0458		.0893	.0949
67.500	.0178														.0774
90.000	.0289					.0312						.0404		.0989	.1185
112.500	.0470														.1860
135.000	.0848				.1614	.0995						.1085		.2991	.2838
157.500	.0778														.3271
180.000	.0808	.0788	.1842	.2229	.2397	.1420	.1324	.1338	.1434	.1332	.1403	.1233	.1851	.3463	.3490

LARC UPWT 1115 (SM-12F), SRB WITHOUT B. L. TRIP (RHA004)

ALPHA (A) = 30.000 MACH (I) = 3.700 RN/L = 1.501 HREF = .037 PO = 3011.800 TO = 709.000

SECTION (I)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0288	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	3448	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0817	.0527	.0262	.0153	.0156	.0171	.0171	.0254	.0271	.0237		.0240	.0243	.0196
22.500			.0368				.0153						.0215		
45.000		.0750	.0423	.0210			.0126			.0114			.0165		
67.500			.0734				.0227						.0178		
90.000	.2267	.1881	.1200	.0652			-.9000			.0342			.0376		
112.500			.1811				.0778						.0726		
135.000		.3020	.2077	.1589			.1134			.0987			.1090		
157.500			.2826				.1369						.1271		
180.000		.3806		.2032	.1235	.1228	.1383	.1393	.1263	.1437	.1311	.1332	.1468	.1515	.1339
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0208	.0195	.0406	.0416	.0380	.0140	.0095	.0294	.0283	.0265	.0243	.0185	.0216	.0289	.0268
22.500	.0182														.0234
45.000	.0149				.0177	.0155						.0142		.0255	.0249
67.500	.0191														.0629
90.000	.0392					.0519						.0595		.1388	.1421
112.500	.0756														.2523
135.000	.1114				.3135	.1957						.1880		.4348	.3910
157.500	.1411														.5157
180.000	.1487	.1533	.2849	.4343	.4829	.2852	.3189	.2529	.2693	.2468	.2638	.2404	.3103	.5089	.5983

ALPHA (B) = 40.000 MACH (I) = 3.700 RN/L = 1.503 HREF = .037 PO = 3016.100 TO = 709.000

SECTION (I)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3448	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0529	.0518	.0249	.0109	.0112	.0122	.0130	.0162	.0159	.0132		.0148	.0169	.0109
22.500			.0324				.0125						.0156		
45.000		.0709	.0356	.0196			.0101			.0088			.0136		
67.500			.0711				.0240						.0208		
90.000	.2482	.1791	.1274	.0725			-.9000			.0443			.0479		
112.500			.2042				.1017						.0948		
135.000		.3486	.2405	.1939			.1558			.1381			.1412		
157.500			.3382				.2003						.1640		
180.000		.4312		.2571	.1748	.1785	.2033	.2072	.1714	.1347	.1762	.1710	.1910	.1982	.1882
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0108	.0093	.0162	.0131	.0086	.0045	.0049	.0117	.0119	.0122	.0133	.0114	.0155	.0176	.0157
22.500	.0102														.0128

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA004)

ALPHA (5) = 40.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE M/MREF

X/L	.5412	.5523	.7248	.7357	.7467	.7668	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9489
THETA															
45.000	.0103				.0103	.0075						.0109		.0196	.0166
67.500	.0204														.0566
90.000	.0477					.0880						.0858		.1520	.1483
112.500	.0919														.2849
135.000	.1389				.4132	.2721						.2217		.5081	.4190
157.500	.1771														.5698
180.000	.1873	.1930	.3352	.5868	.6908	.4024	.4793	.2947	.3199	.2939	.3148	.2814	.3713	.7090	.6301

LARC UPWT 1145 (SH-18F), SRB WITHOUT B. L. TRIP (RHA005) (06 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 1.000

ALPHA (1) = .000 MACH (1) = 3.700 RN/L = 3.452 HREF = .056 PO = 6980.800 TO = 714.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.1167	.0897	.0496	.0203	.0213	.0219	.0197	.0132	.0142	.0128		.0134	.0135	.0115
22.500			.0833				.0226						.0144		
45.000		.1103	.0929	.0520			.0236			.0101			.0168		
67.500			.0983				.0240						.0276		
90.000	.1456	.1121	.0898	.0508			.0178			.0387			.0596		
112.500			.0934				.0252						.0557		
135.000		.1144	.0842	.0557			.0239			.0185			.0271		
157.500			.0911				.0235						.0149		
180.000		.1095		.0543	.0211	.0213	.0216	.0206	.0128	.0140	.0120	.0123	.0133	.0134	.0114

X/L	.5412	.5523	.7248	.7357	.7467	.7686	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0129	.0130	.0928	.1123	.1078	.0695	.0888	.0765	.0739	.0754	.0735	.0508	.0879	.1658	.1847
22.500	.0142														.1814
45.000	.0229				.1027	.0580						.0795		.1742	.1800
67.500	.0541														.1766
90.000	.0712					.0679						.0701		.1558	.1679
112.500	.0694														.1615
135.000	.0471				.1221	.0672						.0744		.1673	.1679
157.500	.0200														.1804
180.000	.0134	.0132	.0872	.1047	.1036	.0649	.0789	.0721	.0756	.0687	.0727	.0683	.0847	.1660	.1798

ALPHA (2) = 8.000 MACH (1) = 3.700 RN/L = 3.538 HREF = .056 PO = 6980.300 TO = 702.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0842	.0406	.0262	.0114	.0121	.0129	.0129	.0421	.0502	.0495		.0708	.0758	.0873
22.50			.0527				.0099						.0558		
45.000		.0935	.0970	.0513			.0130			.0097			.0278		
67.500			.1275				.0236						.0146		
90.000	.1784	.1372	.1228	.0571			.0205			.0268			.0244		
112.500			.1387				.0418						0387		
135.000		.1777	.1339	.0840			.0508			.0438			.0477		
157.500			.1591				.0544						.0492		

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA005)

ALPHA (2) = 8.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
180.000		.1874		.0912	.0500	.0503	.0522	.0530	.0475	.0531	.0477	.0508	.0544	.0554	.0513
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0919	.0954	.1207	.1874	.2100	.0916	.0966	.0661	.0616	.0623	.0663	.0609	.0997	.2340	.2600
22.500	.0673														.1915
45.000	.0343				.0773	.0415						.0787		.1504	.1231
67.500	.0165														.1349
90.000	0212					.0460						.0756		.1819	.1946
112.500	.0368														.2273
135.000	.0476				.1764	.0688						.1086		.2793	.2685
157.500	.0537														.3176
180.000	.0551	.0568	.1398	.1859	.2250	.0953	.1214	.1267	.1312	.1198	.1278	.1105	.1446	.3317	.3364

ALPHA (3) = 15.000 MACH (1) = 3.700 RN/L = 3.536 HREF = .056 PO = 6990.300 TO = 703.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0470	.0392	.0257	.0422	.0468	.0557	.0601	.0450	.0591	.0554		.0634	.0649	.0548
22.500			.0401				.0241						.0430		
45.000		.0819	.0649	.0341			.0130			.0122			.0211		
67.500			.0954				.0233						.0149		
90.000	.1860	.1495	.1205	.0581			.0241			.0275			.0274		
112.500			.1533				.0536						.0462		
135.000		.2223	.1575	.1081			.0693			.0562			.0630		
157.500			.1966				.0791						.0693		
180.000		.2438		.1248	.0707	.0718	.0774	.0783	.0672	.0724	.0682	.0717	.0782	[illegible]	.0738
X/L	.5412	.5523	.7246	.7357	.7467	.7666	.7776	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0593	.0588	.1070	.1337	.1390	.0619	.0653	.0638	.0564	.0531	.0473	.0378	.0575	.1578	.2045
22.500	.0384														.1650
45.000	.0243				.0700	.0387						.0508		[illegible]	.0952
67.500	.0178														.0953
90.000	.0280					.0421						.0498		.1370	.1585
112.500	.0458														.2491
135.000	.0643				.2213	.1181						.1399		.3606	.3476
157.500	.0781														.4398
180.000	.0809	.0833	.1919	.2789	.3208	.1611	.1905	.1782	.1871	.1698	.1816	.1640	.2163	.4712	.4717

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RN4005)

ALPHA (4) = 30.000 MACH (1) = 3.700 RN/L = 3.468 HREF = .056 PO = 6958.700 TO = 709.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3448	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0716	.0824	.0331	.0169	.0174	.0191	.0197	.0268	.0277	.0239		.0323	.0321	.0268
22.500			.0440				.0222						.0267		
45.000		.0814	.0489	.0231			.0170			.0141			.0194		
67.500			.0806				.0250						.0193		
90.000	.2289	.1743	.1254	.0675			.0334			.0365			.0394		
112.500			.1868				.0802						.0758		
135.000		.3103	.2109	.1629			.1139			.1006			.1106		
157.500			.2826				.1364						.1249		
180.000		.3858		.2076	.1209	.1224	.1352	.1388	.1244	.1420	.1330	.1308	.1457	.1518	.1297
X/L	.5412	.5523	.7248	.7357	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0288	.0282	.0517	.0533	.0529	.0241	.0 [illegible]	.0323	.0298	.0285	.0248	.0200	.0235	.0387	.0420
22.500	.0223														.0374
45.000	.0162				.0290	.0221						.0209		.0384	.0330
67.500	.0191														.0798
90.000	.0418					.0737						.0760		.1762	.1803
112.500	.0781														.3248
135.000	.1114				.4138	.2514						.2452		.5548	.5034
157.500	.1390														.6785
180.000	.1462	.1521	.3312	.5588	.6877	.3800	.4316	.3231	.3486	.3100	.3396	.2980	.3906	.7595	.7435

ALPHA (5) = 40.000 MACH (1) = 3.700 RN/L = 3.544 HREF = .057 PO = 7008.200 TO = 703.000

SECTION (1)SRB (AFT STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3448	.3557	.4206	.4317	.4427	.5302
THETA															
.000		.0655	.0711	.0300	.0199	.0208	.0253	.0280	.0207	.0221	.0192		.0202	.0213	.0190
22.500			.0388				.0237						.0191		
45.000		.0743	.0390	.0192			.0175			.0116			.0151		
67.500			[illegible]				.0282						.0213		
90.000	.2785	.2036	[illegible]	.0780			-.9000			.0507			.0546		
112.500							.1168						.1095		
135.000		.4223	[illegible]	.2149			.1813			.1572			.1650		
157.500			[illegible]				.2306						.1855		
180.000		.5323		.1858	.2031	.2041	.2294	.2387	.2071	.2285	.2181	.2081	.2225	.2340	.2007
X/L	.5412	.5523	.7248	.7357	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
.000	.0199	.0185	.0313	.0238	.0183	.0090	.0098	.0285	.0205	.0289	.0282	.0232	.0304	.0333	.0333
22.500	.0188														.0239

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA005)

ALPHA (5) = 40.000 MACH (1) = 3.700

SECTION (1)SRB (AFT STING MT) COEFFICIENT VARIABLE M/MREF

X/L	.5412	.5523	.7246	.7357	.7467	.7688	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9499
THETA															
45.000	.0162				.0226	.0132						.0214		.0282	.0241
67.500	.0261														.0785
90.000	.0580					.0837						.0890		.2139	.2117
112.500	.1081														.3978
135.000	.1632				.7311	.3850						.3311		.7955	.6350
157.500	.2083														.9128
180.000	.2194	.2230	.4868	1.1275	1.5467	.5508	.9517	.4721	.5121	.4238	.4808	.40E.	.5801	1.1472	1.0404

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA008) (06 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 1.500
MODEL = 2.000

ALPHA (1) = 60.000 MACH (1) = 3.700 RN/L = 1.534 HREF = .037 PO = 3007.100 TO = 700.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3448	.3557	.3667	.7138	.7248	.7357
THETA															
.000	.0727		.0376	.0219	.0164	.0097	.0101	.0092	.0127	.0135	.0154	.0149	.0090	.0089	.0052
22.500			.0184				.0102			.0142			.0103		
45.000		.0491	.0195	.0100			.0089			.0125			.0093		
67.500			.0480				.0200			.0232			.0192		
90.000	.2322	.1380	.1085	.0725			.0540			.0655			.0365		
112.500			.1964				.1188			.1362			.0897		
135.000		.3827	.3003	.2309			.1968			.1928					
157.500			.4126				.2751			.2994			.1830		
180.000	.6234	.5221	.4482	.3523	.3357	.2738	.2921	.2772	.3156	.3066	.3086		.2067	.2493	.4741

X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809
THETA														
.000	.0032	.0093	.0057	.0191	.0214	.0214	.0218	.0179	.0138	.0084	.0077	.0116	.0066	.0235
22.500												.0115		
45.000	.0161	.0039						.0158		.0129		.0138	.0060	.0098
67.500												.0444		
90.000	.1484	.0564						.0625		.1390		.1177	.0047	.0208
112.500												.1923		
135.000	.4038	.2248						.2200		.4577		.2920	.0049	.0579
157.500												.4006		
180.000	.6056	.3650	.7179		.3343	.3385	.3286	.3325	.4419	.8143	.5328	.4451	.0058	.1046

ALPHA (2) = 75.000 MACH (1) = 3.700 RN/L = 1.503 HREF = .037 PO = 3015.500 TO = 709.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3448	.3557	.3667	.7138	.7248	.7357
THETA															
.000	.0509		.0177	.0150	.0127	.0099	.0121	.0106	.0092	.0088	.0096	.0102	.0061	.0060	.0043
22.500			.0145				.0113			.0090			.0074		
45.000		.0383	.0166	.0150			.0103			.0099			.0082		
67.500			.0411				.0231			.0269			.0217		
90.000	.2184	.1308	.0999	.0780			.0632			.0787			.0444		
112.500			.1928				.1341			.1544			.1077		
135.000		.3675	.3013	.2587			.2168			.2245					
157.500			.4209				.3088			.3333			.2171		

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA006)

ALPHA (2) = 75.000 MACH (1) = 3.700

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
180.000	.5685	.5081	.4852	.4017	.3795	.2948	.3209	.2999	.3577	.3451	.3478		.2430	.2807	.2990
X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0019	.0070	.0014	.0189	.0208	.0198	.0170	.0132	.0121	.0137	.0167	.0196	.0093	.0238	
22.500												.0166			
45.000	.0075	.0023						.0125		.0106		.0129	.0087	.0128	
67.500												.0276			
90.000	.0749	.0884						.0898		.0773		.0797	.0097	.0482	
112.500												.1300			
135.000	.2402	.3308						.2114		.2268		.1935	.0120	.1301	
157.500												.2547			
180.000	.3700	.4893	.4817		.2851	.2905	.2867	.2831	.2901	.2933	.2974	.2773	.0132	.2165	

ALPHA (3) = 90.000 MACH (1) = 3.700 RN/L = 1.551 HREF = .037 PO = 3015.400 TO = 895.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0307		.0098	.0087	.0076	.0115	.0110	.0138	.0044	.0054	.0058	.0066	.0069	.0080	.0084
22.500			.0091				.0130			.0058			.0060		
45.000		.0227	.0101	.0116			.0103			.0068			.0048		
67.500			.0282				.0215			.0231			.0194		
90.000	.1667	.0944	.0761	.0652			.0598			.0717			.0454		
112.500			.1558				.1291			.1496			.1155		
135.000		.3058	.2494	.2427			.2078			.2131					
157.500			.3498				.2850			.3260			.2422		
180.000	.4728	.4274	.3868	.3809	.3581	.2930	.3077	.2859	.3571	.3406	.3418		.2742	.3007	.3086
X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0035	.0034	.0045	.0058	.0097	.0117	.0145	.0148	.0154	.0148	.0141	.0128	.0395	.0456	
22.500												.0124			
45.000	.0043	.0014						.0100		.0098		.0129	.0381	.0265	
67.500												.0211			
90.000	.0583	.0557						.0883		.0578		.0660	.0419	.0615	
112.500												.1194			
135.000	.1920	.1948						.2139		.1971		.1909	.0497	.1895	
157.500												.2670			
180.000	.2793	.2695	.2946		.2985	.3037	.3017	.2998	.3065	.2655	.2834	.2954	.0551	.3159	

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA006)

ALPHA (4) = 105.000 MACH (1) = 3.700 RN/L = 1.511 HREF = .037 PO = 3012.000 TO = 707.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0309		.0213	.0131	.0095	.0057	-.9000	.0042	.0071	.0060	.0056	.0039	.0051	.0051	.0052
22.500			.0184				.0047			.0060			.0048		
45.000		.0218	.0161	.0112			.0068			.0082			.0068		
67.500			.0232				.0213			.0252			.0295		
90.000	.1070	.0536	.0544	.0841			.0580			.0681			.0644		
112.500			.1077				.1124			.1340			.1606		
135.000		.1767	.1684	.1937			.1758			.1929					
157.500			.2278				.2353			.2764			.3382		
180.000	.2474	.2415	.2519	.2831	.2704	.2349	.2470	.2228	.3037	.2897	.2757		.3767	.5781	.6898

X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0044	.0159	.0159	.0146	.0128	.0116	.0104	.0086	.0082	.0074	.0083	.0112	.1238	.0583	
22.500												.0118			
45.000	.0089	.0112						.0124		.0099		.0126	.1124	.0447	
67.500												.0242			
90.000	.0879	.0955						.0828		.0557		.0747	.1075	.0812	
112.500												.1186			
135.000	.2878	.3104						.3271		.1908		.1804	.1169	.1492	
157.500												.2419			
180.000	.4902	.4365	.3418		.3341	.3651	.4176	.5054	.6134	2756	.2578	.2658	.1251	.2307	

ALPHA (5) = 120.000 MACH (1) = 3.700 RN/L = 1.525 HREF = .037 PO = 3014.800 TO = 703.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0383		.0210	.0128	.0104	.0052	.0077	.0066	.0083	.0071	.0068	.0043	.0048	.0074	.0083
22.500			.0181				.0069			.0078			.0052		
45.000		.0252	.0168	.0131			.0097			.0102			.0085		
67.500			.0272				.0257			.0296			.0326		
90.000	.1048	.0683	.0617	.0893			.0635			.0769			.0734		
112.500			.1212				.1224			.1455			.1819		
135.000		.1685	.1835	.2113			.1922			.2180					
157.500			.2497				.2653			.3191			.4030		
180.000	.2214	.2239	.2781	.3330	.3131	.2744	.2921	.2631	.3854	.3443	.3238		.4506	.7161	.7678

X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0088	.0212	0203	.0160	.0146	.0139	.0119	.0101	.0090	.0085	.0099	.0149	.1435	.0716	
22.500												.0134			

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA008)

ALPHA (S) = 120.000 MACH ( ) = 3.700

SECTION ( )SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.7467	.7668	.7778	.8505	.8816	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809
THETA														
45.000	.0131	.0169						.0131		.0098		.0141	.1302	.0560
67.500												.0271		
90 000	.0778	.1127						.0927		.0606		.0818	.1238	.0702
112.500												.1362		
135.000	.2998	.3694						.3829		.2011		.2034	.1334	.1586
157.500												.2673		
180.000	.4973	.5292	.4257		.4043	.4522	.5278	.6441	.7206	.2924	.2814	.2881	.1415	.2416

LARC UPW 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA007) (08 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 2.000

ALPHA (1) = 60.000 MACH (1) = 3.700 RN/L = 3.627 HREF = .057 PO = 7006.300 TO = 883.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0642		.0568	.0295	.0343	.0134	.0133	.0122	.0119	.0139	.0154	.0156	.0075	.0073	.0051
22.500			.0359				.0121			.0132			.0094		
45.000		.0439	.0233	.0199			.0095			.0141			.0107		
67.500			.0467				.0178			.0245			.0200		
90.000	.2199	.1334	.1057	.0921			.0545			.0688			.0386		
112.500			.1975				.1226			.1408			.0949		
135.000		.3848	.2989	.2728			.1960			.1896					
157.500			.4109				.2725			.2960			.1868		
180.000	.6584	.5278	.4453	.3553	.3388	.2737	.2886	.2679	.3170	.3113	.3133		.2140	.2744	.6809

X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0035	.0100	.0058	.0233	.0273	.0308	.0339	.0308	.0268	.0178	.0150	.0123	.0072	.0310	
22.500												.0122			
45.000	.0158	.0052						.0195		.0150		.0148	.0081	.0112	
67.500												.0441			
90.000	.1838	.0813						.0638		.1401		.1397	.0065	.0213	
112.500												.2353			
135.000	.5294	.2552						.2575		.4969		.3764	.0082	.0622	
157.500												.5181			
180.000	.8158	.3710	.8355		.4246	.4141	.3879	.3858	.4709	.6140	.5593	.5639	.0099	.1412	

ALPHA (2) = 75.000 MACH (1) = 3.700 RN/L = 3.509 HREF = .058 PO = 6987.300 TO = 706.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0536		.0425	.0281	.0231	.0120	.0125	.0115	.0145	.0100	.0081	.0072	.0075	.0069	.0053
22.500			.0340				.0188			.0094			.0087		
45.000		.0446	.0243	.0228			.0159			.0102			.0094		
67.500			.0466				.0275			.0308			.0237		
90.000	.2293	.1395	.1114	.0840			.0713			.0868			.0483		
112.500			.2141				.1505			9			.1192		
135.000		.4121	.3398	.2925			.2433			[illegible]					
157.500			.4857				.3409			.3740			.2330		

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA007)

ALPHA (2) = 75.000 MACH (1) = 3.700

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
180.000	.7125	.5848	.5381	.4652	.4370	.3329	.3609	.3322	.4031	.3947	.3949		.2658	.3023	.3212

X/L	.7487	.7686	.7776	.8505	.8816	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0032	.0095	.0044	.0240	.0259	.0227	.0180	.0152	.0221	.0323	.0323	.0268	.0190	.0294	
22.500												.0245			
45.000	.0117	.0031						.0146		.0160		.0172	.0183	.0183	
67.500												.0302			
90.000	.1034	.1079						.0768		.0829		.0834	0192	.0570	
112.500												.1338			
135.000	.2924	.4144						.2299		.2454		.2005	.0223	.1498	
157.500												.2681			
180.000	.4341	.6212	.5853		.2888	.2990	.3030	.3167	.3397	.3215	.3079	.2927	.0244	.7813	

ALPHA (3) = 90.000 MACH (1) = 3.700 RN/L = 3.540 HREF = .056 PO = 8996.800 TO = 703.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0434		.0108	.0102	.0093	.0123	.0141	.0140	.0040	.0044	.0042	.0049	.0063	.0088	.0074
22.500			.0103				.0136			.0042			.0055		
45.000		.0302	.0127	.0120			.0127			.0076			.0058		
67.500			.0362				.0278			.0298			.0230		
90.000	.1745	.1099	.0898	.0762			.0699			.0836			.0491		
112.500			.1718				.1397			.1870			.1198		
135.000		.3128	.2684	.2542			.2185			.2355					
157.500			.3714				.3025			.3452			.2360		
180.000	.4750	.4332	.4088	.3865	.3593	.2849	.3105	.2835	.3727	.3547	.3506		.2662	.3060	.3188

X/L	.7487	.7686	.7776	.8505	.8816	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0042	.0051	.0022	.0145	.0183	.0189	.0179	.0174	.0174	.0152	.0141	.0127	.0507	.0600	
22.500												.0121			
45.000	.0067	.0016						.0122		.0106		.0135	.0499	.0316	
67.500												.0232			
90.000	.0707	.0692						.0671		.0621		.0699	.0503	.0667	
112.500												.1185			
135.000	.2134	.2208						.2144		.1984		.1861	.0572	.1943	
157.500												.2559			
180.000	.3045	.2898	.3008		.2949	.2988	.2964	.2958	.3039	.2556	.2698	.2793	.0634	1.1578	

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA007)

ALPHA (A) = 105.000 MACH (I) = 3.700 RN/L = 3.407 HREF = .058 PO = 6959.800 TO = 718.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE M/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3448	.3557	.3667	.7138	.7248	.7357
THETA															
.000	.0386		.0238	.0201	.0158	.0064	.0053	.0082	.0069	.0087	.0060	.0051	.0081	.0065	.0049
22.500			.0216				.0059			.0083			.0064		
45.000		.0268	.0213	.0172			.0082			.0086			.0068		
67.500			.0422				.0262			.0309			.0245		
90.000	.1430	.0899	.0998	.0732			.0684			.0790			.0504		
112.500			.1926				.1313			.1548			.1221		
135.000		.2633	.3040	.2291			.2036			.2156					
157.500			.4178				.2714			.3036			.2469		
180.000	.3837	.3631	.4164	.3329	.3028	.2675	.2785	.2495	.3326	.3142	.3003		.2663	.3588	.4927
X/L	.7467	.7668	.7776	.8505	.8618	.8726	.8837	.8947	.9058	.9273	.9389	.9499	.9718	.9809	
THETA															
.000	.0031	.0112	.0045	.0265	.0231	.0190	.0165	.0141	.0134	.0102	.0097	.0106	.1199	.0600	
22.500												.0118			
45.000	.0088	.0035						.0155		.0134		.0143	.1080	.0406	
67.500												.0257			
90.000	.0983	.0886						0751		.0627		.0706	.0997	.0577	
112.500												.1185			
135.000	.3431	.2697						.2484		.2012		.1847	.1048	.1665	
157.500												.2550			
180.000	.5306	.3323	.2427		.2892	.3049	.3241	.3508	.4103	.2721	.2755	.2794	.1109	.2663	

ALPHA (5) = 120.000 MACH (I) = 3.700 RN/L = 3.554 HREF = .058 PO = 6959.800 TO = 899.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE M/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3338	.3448	.3557	.3667	.7138	.7248	.7357
THETA															
.000	.0269		.0147	.0118	.0100	.0077	.0109	.0079	.0099	.0090	.0076	.0066	.0103	.0149	.0153
22.500			.0129				.0078			.0078			.0106		
45.000		.0193	.0134	.0107			.0087			.0107			.0104		
67.500			.0251				.0282			.0327			.0341		
90.000	.1185	.0683	.0839	.0653			.0794			.0934			.0818		
112.500			.1341				.1762			.2062			.2211		
135.000		.2300	.2188	.3428			.3153			.3298					
157.500			.3140				.4873			.5833			.5222		
180.000	.3430	.3578	.3546	.6118	.5898	.5140	.5293	.4563	.6543	.5903	.5660		.5949	.9677	1.0182
X/L	.7467	.7668	.7778	.8505	.8618	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0125	.0269	.0381	.0195	.0181	.0158	.0145	.0119	.0116	.0109	.0120	.0163	.1703	.0912	
22.500												.0145			

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA007)

ALPHA (5) = 120.000 MACH (1) = 3.700

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.7487	.7686	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809
THETA														
45.000	.0151	.0312						.0132		.0119		.0134	.1530	.0542
67.500												.0261		
90.000	.0858	.1511						.0923		.0834		.0915	.1467	.0863
112.500												.1530		
135.000	.3331	.4995						.4382		.2246		.2455	.1579	.1621
157.500												.3485		
180.000	.5609	.6880	.5925		.5745	.5951	.6504	.7505	.8268	.3150	.3149	.3477	.1715	.2538

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA008) (08 JUN 75)

REFERENCE DATA

SREF = 15836.0000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 2.000

ALPHA (1) = 60.000 MACH (1) = 3.700 RN/L = 3.472 MREF = .056 PO = 6925.300 TO = 708.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0840		-.9000	.0233	.0241	.0181	.0173	.0 49	.0175	.0155	.0117	.0088	.0053	.0063	.0050
22.500			.0329				.0138			.0153			.0072		
45.000		.0590	.0261	.0193			.0123			.0299			.0105		
67.500			.0515				.0220			.0893			.0233		
90.000	.2185	.1393	.1072	.0837			.0553			.0790			.0387		
112.500			.1871				.1113			.1279			.0816		
135.000		.3442	.2728	.2240			.1699			.1705					
157.500			.3801				.2275			.2407			.1459		
180.000	.5118	.4431	.3879	.3078	.2860	.2088	.2354	.2254	.2453	.2525	.2507		.1545	.2553	.4889

X/L	.7467	.7868	.7776	.8505	.8616	.8726	.8837	1947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0043	.0127	.0058	.0223	.0257	.0288	.0315	.0295	.0274	.0178	.0158	.0133	.0078	.0285	
22.500												.0128			
45.000	.0215	.0049						.0207		.0178		.0178	.0073	.0127	
67.500												.0528			
90.000	.1722	.0848						.0807		.1479		.1480	.0074	.0241	
112.500												.2509			
135.000	.4867	.3001						.2797		.4909		.3892	.0083	.0711	
157.500												.4845			
180.000	.6594	.4248	.6088		.3991	3993	.3900	.4001	.4885	.5969	.5789	.5203	.0093	.1702	

ALPHA (2) = 75.000 MACH (1) = 3.700 RN/L = 3.549 MREF = .056 PO = 6953.800 TO = 700.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/MREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0376		-.9000	.0182	.0168	.0099	.0115	.0114	.0078	.0082	.0083	.0084	.0074	.0067	.0048
22 500			.0386				.0148			.0089			.0080		
45.000		.0356	.0241	.0245			.0150			.0213			.0081		
67.500			.0392				.0226			.0784			.0206		
90.000	.1952	.1184	.0949	.0721			.0614			.0789			.0446		
112.500			.1808				.1302			.1493			.1092		
135.000		.3518	.2843	.2468			.2079			.2087					
157.500			.3958				.2902			.3135			.2226		

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA008)

ALPHA (2) = 75.000 MACH (1) = 3.700

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
180.000	.5657	.4830	.4332	.3826	.3591	.2862	.3051	.2847	.3368	.3296	.3287		.2406	.2678	.2825
X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0034	.0083	.0041	.0234	.0241	.0198	.0143	.0129	.0210	.0318	.0311	.0250	.0180	.0289	
22.500												.0236			
45.000	.0107	.0037						.0129		.0157		.0161	.0169	.0168	
67.500												.0278			
90.000	.0911	.0935						.0696		.0777		.0788	.0186	.0550	
112.500												.1256			
135.000	.2593	.3621						.2128		.2292		.1868	.0220	.1447	
157.500												.2516			
180.000	.3839	.5354	.4917		.2659	.2721	.2752	.2871	.3129	.2982	.2853	.2728	.0240	.7370	

ALPHA (3) = 90.000 MACH (1) = 3.700 RN/L = 3.521 HREF = .056 PO = 6983.300 TO = 704.000

SECTION (1)SRB (CTR STING MT) DEPENDENT VARIABLE H/HREF

X/L	.0265	.0495	.0972	.1193	.1303	.1789	.1900	.2010	.3336	.3446	.3557	.3667	.7136	.7246	.7357
THETA															
.000	.0398		-.9000	.0169	.0148	.0140	.0163	.0181	.0105	.0110	.0094	.0074	.0086	.0108	.0094
22.500			.0154				.0165			.0132			.0068		
45.000		.0300	.0154	.0137			.0150			.0231			.0067		
67.500			.0362				.0277			.0576			.0246		
90.000	.1783	.1097	.0893	.0759			.0704			.0874			.0498		
112.500			.1725				.1418			.1683			.1214		
135.000		.3222	.2887	.2588			.2202			.2345					
157.500			.3756				.3047			.3436			.2483		
180.000	.4980	.4478	.4148	.4042	.3743	.2962	.3181	.2913	.3758	.3598	.3548		.2711	.3077	.3226
X/L	.7467	.7668	.7778	.8505	.8616	.8726	.8837	.8947	.9058	.9278	.9389	.9499	.9718	.9809	
THETA															
.000	.0058	.0084	.0044	.0170	.0179	.0187	.0194	.0192	.0197	.0182	.0158	.0142	.0527	.0614	
22.500												.0130			
45.000	.0073	.0037						.0149		.0117		.0145	.0507	.0341	
67.500												.0252			
90.000	.0698	.0668						.0705		.0651		.0731	.0509	.0681	
112.500												.1235			
135.000	.2140	.2206						.2230		.2012		.1888	.0564	.1939	
157.500												.2577			
180.000	.3035	.2913	.3039		.3041	.3075	.3056	.3089	.3157	.2809	.2743	.2801	.0623	-.9000	

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA009) (06 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 1.500
MODEL = 3.000

ALPHA (1) = 180.000 MACH (1) = 3.700 RN/L = 1.521 HREF = .037 PO = 3010.300 TO = 704.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE M/MREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0090	.0091	.0065	.0114	.0127	.0131	.0059	.0085	.0063	.0114	.0131	.0126	.0147	.0147	.0135
22.500														.0121	
45.000		.0101			.0129			.0098			.0114			.0115	
67.500														.0222	
90.000		.0583			.0674			.0689			.0582			.0565	
112.500														.1196	
135.000		.2052			.2387			.2314			.2329			.2147	
157.500														.3075	
180.000	.3188	.2874	.2010	.3275	.3484	.3409	.3723	.3523	.3051	.3632	.3539	.3375	.3370	.3333	.3099

X/L	.7251	.7362	.7472	.7687	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9268	.9377	.9487	.9726
THETA															
.000	.0149	.0127	.0160	.0288	.0270	.0333	.0348	.0349	-.9000	.0309	.0271	.0218	.0198	.0251	.2680
22.500	.0171									.0233				.0205	
45.000	.0180		.0116	.0234						.0168		.0154		.0163	.2547
67.500	.0390									.0308				.0244	
90.000	.1053		.0811	.1101						.0702		.0649		.0575	.2418
112.500	.2442									.1308				.1166	
135.000	.3997		.2857	.4181						.2209		.1669		.1766	.2345
157.500	.5116									.2787				.2326	
180.000	.4776	.4370	.4033	.5893	.4755	.3038	.3095	.3094	.3284	.3368	.3275	.2218	.2295	.2497	.2334

X/L	.9810
THETA	
.000	.0977
22.500	.0767
45.000	.0758
67.500	.0954
90.000	.1341
112.500	.2094
135.000	.2963
157.500	-.9000
180.000	.3687

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA009)

ALPHA (2) = 150.000 MACH (1) = 3.700 RN/L = 1.502 HREF = .037 PO = 3018.300 TO = 710.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0133	.0130	.0092	.0153	.0169	.0172	.0203	.0190	.0171	.0211	.0212	.0205	.0235	.0246	.0225
22.500														.0169	
45.000		.0133			.0162			.0181			.0186			.0186	
67.500														.0227	
90.000		.0507			.0554			.0541			.0524			.0513	
112.500														.1104	
135.000		.1552			.1858			.1672			.1859			.1798	
157.500														.2514	
180.000	.2404	.2223	.1598	.2489	.2614	.2557	.2458	.2403	.2156	.2707	.2715	.2628	.2690	.2641	.2495

X/L	.7251	.7382	.7472	.7667	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9268	.9377	.9487	.9728
THETA															
.000	.0211	.0175	.0237	.0498	.0452	.0412	.0467	.0504	-.9000	.0520	.0486	.0339	.0273	.0305	.2220
22.500	.0282									.0367				.0262	
45.000	.0328		.0189	.0292						.0263		.0195		.0203	.2025
67.500	.0348									.0413				.0300	
90.000	.0760		.0575	.0790						.0844		.0590		.0593	.1711
112.500	.1712									.1350				.0962	
135.000	.2767		.1957	.2883						.1975		.1594		.1391	.1631
157.500	.3538									.2241				.1936	
180.000	.3439	.3213	.2815	.4052	.3328	.2089	.2184	.2222	.2454	.2625	.2662	.1975	.2018	.2158	.1642

X/L	.9810
THETA	
.000	.1254
22.500	.0969
45.000	.0948
67.500	.1102
90.000	.1410
112.500	.2031
135.000	.2675
157.500	-.9000
180.000	.3226

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA009)

ALPHA (3) = 170.000 MACH (1) = 1.700 RN/L = 1.516 HREF = .037 PO = 3021.700 TO = 707.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0404	.0391	.0265	.0427	.0483	.0458	.0439	.0423	.0398	.0462	.0478	.0449	.0456	.0467	.0439
22.500														.0544	
45.000		.0228			.0260			.0238			.0235			.0300	
67.500														.0209	
90.000		.0218			-.9000			.0228			.0204			.0234	
112.500														.0421	
135.000		.0586			.0652			.0556			.0582			.0594	
157.500														.0717	
180.000	.0785	.0729	.0528	.0779	.0835	.0822	.0723	.0709	.0633	.0731	.0730	.0720	.0732	.0740	.0721

X/L	.7251	.7362	.7472	.7687	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9266	.9377	.9487	.9726
THETA															
.000	.0825	0451	.0399	.0576	.0506	.0480	.0521	.0544	-.9000	.0550	.0453	.0268	.0257	.0327	.1080
22.500	.0662									.0483				.0334	
45.000	.0562		.0329	.0551						.0560		.0270		.0390	.1012
67.500	.0506									.0723				.0506	
90.000	-.9000		.0421	.0740						.0946		.0530		.0702	.0814
112.500	.0881									.1110				.0813	
135.000	.1084		.0702	.1284						.1309		.0898		.0824	.0699
157.500	.1209									.1317				.0926	
180.000	.1157	.0948	.0831	.1365	.1122	.0999	.1112	.1220	.1415	.1455	.1281	.0744	.0755	.0976	.0689

X/L	.9610
THETA	
.000	.0803
22.500	.0713
45.000	.0883
67.500	.1011
90.000	.1160
112.500	.1498
135.000	.1823
157.500	-.9000
180.000	.1981

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA009)

ALPHA (A) = 180.000 MACH ( ) = 3.700 RN/L = 1.517 HREF = .037 PO = 3021.000 TO = 708.000

SECTION ( )SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

Y	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0320	.0311	.0218	.0337	.0364	.0350	.0317	.0313	.0300	.0342	.0358	.0336	.0353	.0370	.0356
22.500														.0340	
45.000		.0331			.0385			.0338			.0380			.0382	
67.500														.0382	
90.000		.0327			-.9010			.0344			.0344			.0367	
112.500														.0374	
135.000		.0304			.0344			.0321			.0344			.0375	
157.500														.0369	
180.000	.0290	.0268	.0198	.0295	.0325	.0312	.0300	.0300	.0276	.0323	.0340	.0323	.0340	.0354	.03[illegible]
X/L	.7251	.7362	.7472	.7667	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9266	.9377	.9487	.97[illegible]
THETA															
.000	.0715	.0561	.0534	.0848	.0737	.0676	.0763	.0842	-.9[illegible]0	.0886	.0725	.0425	.0448	.0602	.0674
22.500	.0745									.0871				.0586	
45.000	.0723		.0495	.0909						.0890		.0418		.0594	.0674
67.500	.0731									.0858				.0569	
90.000	-.9000		.0484	.0821						.0863		.0418		.0606	.0690
112.500	.0705									.0851				.0598	
135.000	.0667		.0433	.0809						.0893		.0419		.0549	.0724
157.500	.0657									.0828				.0573	
180.000	.0600	.0474	.0411	.0725	.0678	.0717	.0785	.0845	.0918	0868	.0681	.0302	.0415	.0573	.0766
X/L	.9819														
THETA															
.000	.1004														
22.500	.0905														
45.000	.0986														
67.500	.0992														
90.000	.0970														
112.500	.0988														
135.000	.0969														
157.500	-.9000														
180.000	.0815														

LARC UPWT 1115 'SH-12F), SRB WITHOUT B. L. TRIP (RHA010) (06 JUN 75)

REFERENCE DATA

SREF = 15836.8000 SQ.IN. XMRP = .0000 INCHES
LREF = 142.0000 INCHES YMRP = .0000 INCHES
BREF = 142.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0130

PARAMETRIC DATA

BETA = .000 RN/L = 3.500
MODEL = 3 000

ALPHA (1) = 140.000 MACH (1) = 3.700 RN/L = 3.431 HREF = .057 PO = 7010.300 TO = 718.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0124	.0125	.0091	.0120	.0124	.0119	.0103	.0100	.0089	.0147	.0157	.0153	.0187	.0200	.0182
22.500														.0159	
45.000		.0137			.0152			.0139			.0160			.0166	
67.500														.0300	
90.000		.0710			.0850			.0886			.0779			.0729	
112.500														.1557	
135.000		.2320			.2897			.2844			.2964			.2708	
157.500														.3831	
180.000	.3491	.2990	.2122	.3786	.3985	.3790	.4588	.4123	.3285	.4702	.4422	.4102	.4198	.4095	.3871

X/L	.7251	.7362	.7472	.7687	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9266	.9377	.9487	.9726
THETA															
.000	.0251	.0228	.0274	.0411	.0383	.0380	.0414	.0423	-.9000	.0393	.0349	.0299	.0259	.0304	.2930
22.500	.0259									.0302				.0283	
45.000	.0250		.0205	.0328						.0227		.0220		.0226	.2784
67.500	.0483									.0378				.0319	
90.000	.1171		.1083	.1298						.0838		.0807		.0690	.2815
112.500	.2709									.1540				.1332	
135.000	.4363		.3111	.4856						.2681		.2198		.2082	.2548
157.500	.5903									.3357				.2803	
180.000	.5660	.5558	.5125	.6894	.5055	.3998	.4116	.4048	.4267	.4194	.4201	.3049	.3008	.3027	.2537

X/L	.9810
THETA	
.000	.1117
22.500	.0918
45.000	.0909
67.500	.1048
90.000	.1378
112.500	.2109
135.000	.2925
157.500	-.9000
180.000	.3428

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA010)

ALPHA (2) = 150.000 MACH (1) = 3.700 RN/L = 3.402 HREF = .057 PO = 6981.800 TO = 720.000

SECTION (1):SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0183	.0180	.0119	.0200	.0227	.0232	.0237	.0242	.0224	.0269	.0282	.0281	.0299	.0316	.0302
22.500														.0240	
45.000		.0165			.0202			.0200			.0230			.0233	
67.500														.0284	
90.000		.0637			.0892			.0693			.0684			.0651	
112.500														.1367	
135.000		.1948			.2343			.2149			.2347			.2235	
157.500														.3100	
180.000	.2968	.2456	.1760	.3084	.3209	.2952	.3079	.3069	.2639	.3425	.3222	.3148	.3332	.3202	.3079

X/L	.7251	.7362	.7472	.7667	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9268	.9377	.9487	.9726
THETA															
.000	.0366	.0299	.0396	.0727	.0651	.0488	.0538	.0589	-.9000	.0638	.0603	.0459	.0352	.0367	.2643
22.500	.0432									.0452				.0338	
45.000	.0418		.0285	.0418						.0332		.0264		.0259	.2533
67.500	.0418									.0472				.0344	
90.000	.0896		.0711	.0907						.0958		.0733		.0658	.2205
112.500	.1974									.1587				.1101	
135.000	.3237		.2285	.3331						.2383		.1973		.1697	.2042
157.500	.4208									.2690				.2348	
180.000	.4096	.3865	.3589	.4798	.4066	.2782	.2835	.2854	.3027	.3093	.3331	.2430	.2434	.2572	.1976

X/L	.9810
THETA	
.000	.1520
22.500	.1164
45.000	.1129
67.500	.1238
90.000	.1568
112.500	.2253
135.000	.2924
157.500	-.9000
180.000	.3911

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA010)

ALPHA (3) = 160.000 MACH (1) = 3.700 RN/L = 3.455 HREF = .057 PO = 6981.300 TO = 713.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE H/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0320	.0325	.0231	.0363	.0380	.0387	.0365	.0348	.0318	.0384	.0411	.0398	.0458	.0479	.0444
22.500														.0367	
45.000		.0282			.0302			.0275			.0337			.0353	
67.500														.0714	
90.000		.0453			.0510			.0485			.0448			.0440	
112.500														.0866	
135.000		.1331			.1575			.1392			.1481			.1400	
157.500														.1853	
180.000	.1624	.1687	.1222	.1949	.2089	.2047	.1998	.1917	.1831	.2030	.1998	.1933	.1940	.1966	.1829

X/L	.7251	.7362	.7472	.7667	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9268	.9377	.9487	.9726
THETA															
.000	.0847	.0512	.0830	.0920	.0749	.0838	.0866	.0694	-.9000	.0800	.0760	.0529	.0431	.0464	.1811
22.500	.0685									.0807				.0422	
45.000	.0595		.0417	.0593						.0490		.0351		.0367	.1692
67.500	.0515									.0635				.0521	
90.000	.0726		.0820	.0879						.0958		.0739		.0857	.1521
112.500	.1430									.1319				.1100	
135.000	.1999		.1509	.2233						.1808		.1135		.1211	.1380
157.500	.2483									.1968				.1350	
180.000	.2349	.2095	.2055	.2881	.2298	.1939	.2031	.2088	.2271	.2299	.2109	.1258	.1207	.1407	.1342

X/L	.9810
THETA	
.000	.1230
22.500	.0989
45.000	.1044
67.500	.1158
90.000	.1429
112.500	.2060
135.000	.2691
157.500	-.9000
180.000	.3003

LARC UPWT 1115 (SW-12F), SRB WITHOUT B. L. TRIP (RHA010)

ALPHA (A) = 170.000 MACH (I) = 3.700 RN/L = 3.460 HREF = .057 PO = 6990.000 TO = 712.000

SECTION (11SRB (FWD ST'NO MT) DEPENDENT VARIABLE H/HREF

X/L	1220	1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0423	.0413	.0292	.0476	.0501	.0498	.0482	.0465	.0443	.0487	.0503	.0485	.0518	.0523	.0482
22.500														.0403	
45.000		.0325			.0365			.0289			.0307			.0387	
67.500														.0323	
90.000		.0357			-.9000			.0315			.0288			.0315	
112.500														.0515	
135.000		.0297			.0874			.0735			.0761			.0728	
157.500														.0909	
180.000	1013	0959	.0704	.1049	1095	.1077	.0993	.0948	.0871	.0983	.0961	.0961	.0951	.0932	.0876

X/L	.7251	7362	.7472	7667	7777	.8506	.8617	.8727	.8838	.8948	.9058	.9266	.9377	.9487	.9726
THETA															
000	0962	.0701	0535	0747	.0741	0530	.0548	.0567	-.9000	.0689	.0674	.0424	.0380	.0375	.1120
22.500	.0886									.0664				.0439	
45.000	.0791		.0434	.0786						.0741		.0362		.0483	.1013
67.500	.0674									.0929				.0561	
90.000	-.9000		.0435	.0925						.1147		.0670		.0774	.0833
112.500	1048									.1334				.0906	
135.000	.1259		.0739	.1471						.1545		.0918		.0937	.0729
157.500	.1393									.1508				.1037	
180.000	1332	.1100	0874	.1576	1353	.1115	.1214	.1307	.1521	.1691	1730	.0964	.0922	.1074	.0728

X/L	.9810
THETA	
.000	.0905
22.500	.0878
45.000	.1151
67.500	.1204
90.000	.1384
112.500	.1814
135.000	.2206
57.500	-.9000
180.000	.2334

LARC UPWT 1115 (SH-12F), SRB WITHOUT B. L. TRIP (RHA010)

ALPHA (5) = 180.000 MACH (1) = 3.700 RN/L = 3.469 HREF = .057 PO = 7009.000 TO = 713.000

SECTION (1)SRB (FWD STING MT) DEPENDENT VARIABLE M/HREF

X/L	.1220	.1331	.1441	.1795	.1905	.2016	.3297	.3407	.3518	.4203	.4313	.4424	.5303	.5413	.5524
THETA															
.000	.0460	.0441	.0306	.0479	.0495	.0494	.0452	.0432	.0418	.0474	.0486	.0473	.0519	.0526	.0498
22.500														.0487	
45.000		.0473			.0528			.0472			.0533			.0547	
67.500														.0548	
90.000		.0465			-.9000			.0489			.0463			.0531	
112.500														.0534	
135.000		.0438			.0484			.0457			.0491			.0532	
157.500														.0543	
180.000	.0413	.0394	.0293	.0432	.0456	.0453	.0439	.0428	.0399	.0474	.0468	0480	.0523	.0524	.0498

X/L	.7251	.7382	.7472	.7667	.7777	.8506	.8617	.8727	.8838	.8948	.9058	.9288	.9377	.9487	.9726
THETA															
.000	.0978	.0773	.0698	.1173	.1067	.0805	.0880	.0954	-.9000	.1080	.0953	.0486	.0484	.0591	.0998
22.500	.1037									.1071				.0573	
45.000	.1005		.0629	.1296						.1104		.0478		.0597	.0919
67.500	.1047									.1081				.0572	
90.000	-.9000		.0608	.1164						.1102		.0494		.0624	.0802
112.500	.1003									.1111				.0618	
135.000	.0976		.0581	.1150						.1149		.0503		.0575	.0781
157.500	.0941									.1059				.0602	
180.000	.0858	.0698	.0524	.1012	.1012	.0899	.0970	.1029	.1134	.1147	.1033	.0484	.0480	.0622	.0734

X/L	.9810
THETA	
.000	.0965
22.500	.0890
45.000	.1010
67.500	.1037
90.000	.1025
112.500	.1064
135.000	.1061
157.500	-.9000
180.000	.0938